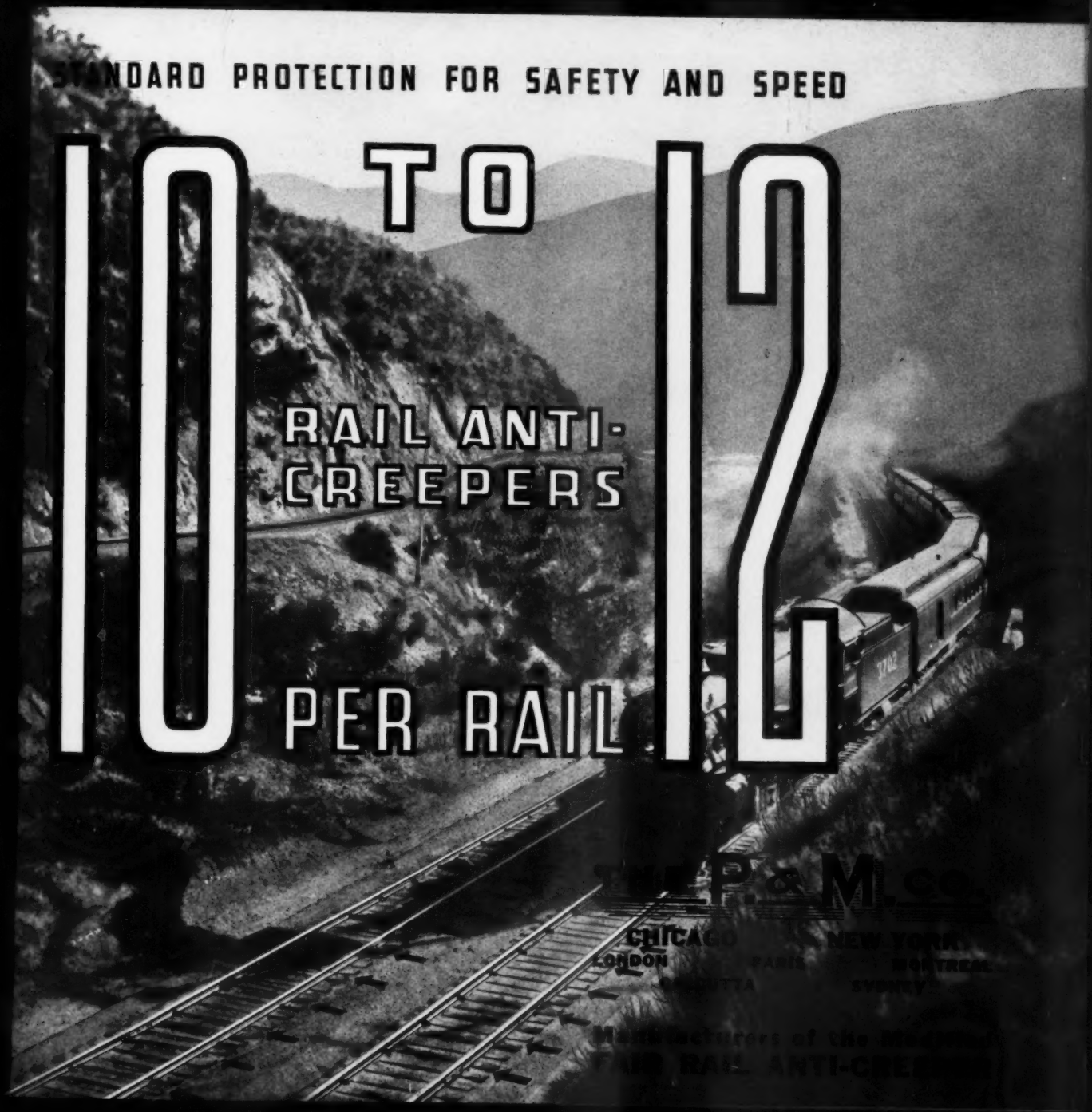
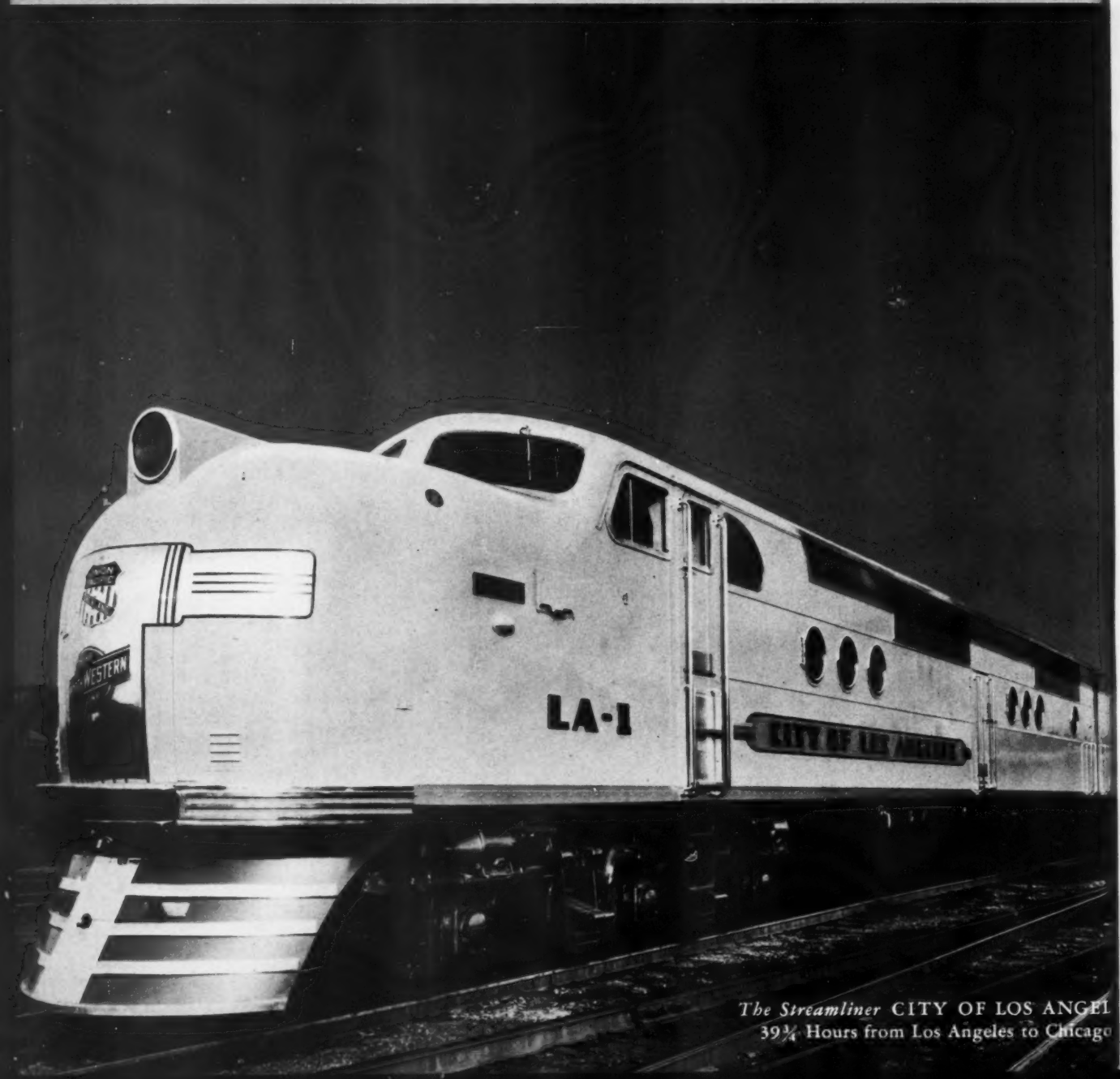

STANDARD PROTECTION FOR SAFETY AND SPEED
10 TO 12
RAIL ANTI-CREEPERS
PER RAIL
CHICAGO
NEW YORK
LONDON
PARIS
MONTREAL
SYDNEY

Reliance HY-CROME Spring Washers

HY-PRESSURE HY-CROME
"Edgemark of Quality"

● Now, more than ever before, values of the HY-PRESSURE HY-CROME *Spring Washer* are appreciated by railroads sensitive to the necessity for smoother riding track. American railroads are providing the finest and fastest transportation in the world, which demands every precaution for safety. HY-CROME *Spring Washers* maintain proper bolt tension and meet these modern requirements. The new City of Los Angeles with its three-car diesel engine power plant, itself 209'6" long, pulling 14 revenue cars in a train nearly one-fourth of a mile long, is an answer to modern demands. So too is the HY-PRESSURE HY-CROME *Spring Washer* . . . most efficient and economical means of maintaining a proper track joint condition. Ask for proof in terms of facts.

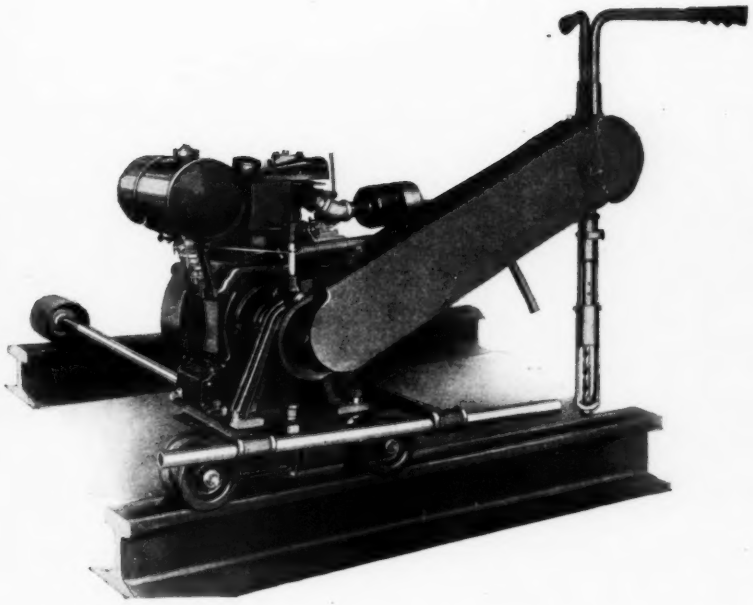
EATON MANUFACTURING COMPANY
RELIANCE SPRING WASHER DIVISION
MASSILLON, OHIO



The Streamliner CITY OF LOS ANGELES
39¾ Hours from Los Angeles to Chicago

Synchronize Spiking

in Rail Laying Operations



2 Raco Tie Borers will bore 1500 to 1700 9/16" x 3" holes per hour in ties, through tie plate holes.

2 Spike Setters will set 1500 to 1700 5/8" cut spikes per hour in these holes.

2 Pneumatic Hammers will drive 1500 to 1700 5/8" cut spikes in these holes per hour.

Eliminate all but two spike setters.

Increase hammer speed 40%.

Bore for Rail Flange Spikes and Tie Plate Anchor Spikes with Raco Tie Boring Machine.

All holes vertical and of same depth.

Spikes centered in tie plate holes. No bent spikes.

No crushing of tie fibre, hence no rot around spike holes.

Elimination of tie splitting. Greater holding power of spikes.

Boring for cut spikes is cheaper and faster; appreciably increases tie life; increases salvage value of spikes.

RAILROAD ACCESSORIES CORPORATION

MAIN OFFICE

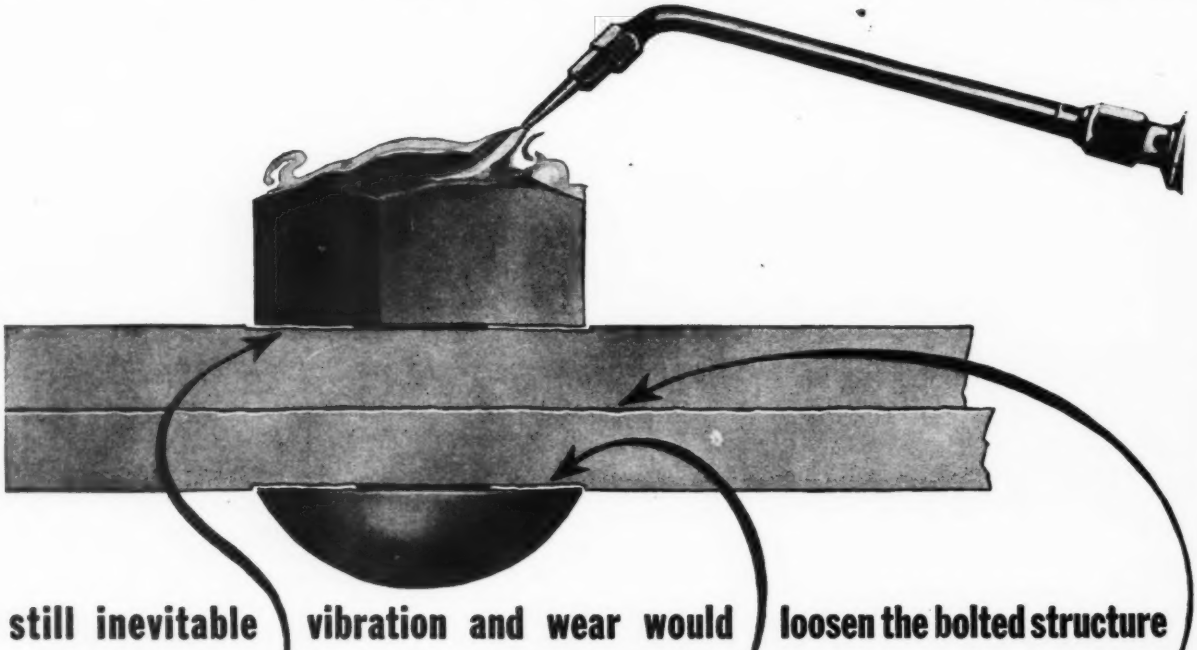
405 LEXINGTON AVENUE

(Chrysler Building)

NEW YORK

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price, United States and Possessions, and Canada, $3.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mt. Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

EVEN IF YOU WELDED THE NUT AND BOLT INTO ONE IMMOVABLE MASS



still inevitable vibration and wear would loosen the bolted structure

HERE *and* **HERE** *and* **HERE**

1 IMPROVED HIPOWER

2 DOUBLE HIPOWER

3 NATIONAL RIB WASHER

4 ANKOR HIPOWER

5 NATIONAL COLLAR GROOVED

6 THACKERAY SPRING WASHER

ONLY A SPRING WASHER CAN SUSTAIN THE BOLT TENSION UNTIL THE TRACK MAN COMES AGAIN.. *only a spring washer!*

That is why Hipower Spring Washers more than pay for themselves in reduced upkeep costs—less labor and maintenance—fewer renewals and repairs.

Hipowers prolong the life of rail and of all joint parts.

Hipowers give an added safety factor to track.

Over 50 years of research and improvements—over 50 years of tests and trials—over 50 years of widespread use by leading railroads prove our spring washers to be one of the best railroad investments.

THE NATIONAL LOCK WASHER COMPANY, Newark, N. J.

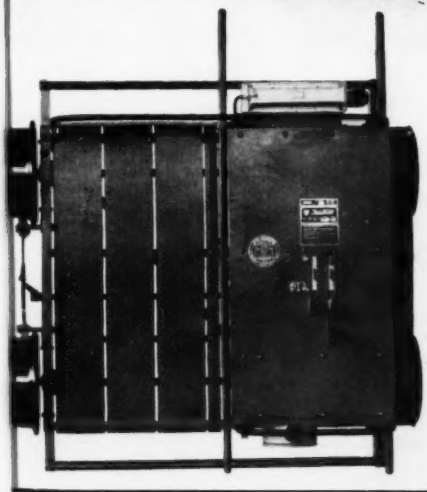
Spring Washers · Retaining Rings · Drop Forgings · Car Window Equipment · Railway and Bus Windows

Performance ON THE JOB COUNTS

Fairmont 59 SERIES C

The 1 to 2 Man Inspection Car With Extra Large Tray

Inspectors of track, signals and bridges can carry in the spacious tray of the Fairmont 59 Series C all of the supplies and tools required for a single trip. The oak frame, insulating the rider from rail-joint vibration, together with the smooth-running 5-to-8 H.P. Fairmont OD engine assures a comfortable ride on even the longest trips. One man can quickly remove this car from the track. Lift handles, extending either front or rear, reduce the actual lift at the rear to only 108 pounds. Rugged construction keeps maintenance costs at the minimum. Write for bulletin 359 for full details. Fairmont Railway Motors, Inc., Fairmont, Minnesota.



The extra wide tray (27¼" x 44¾") olds all the battery material a signalman ould want to carry on one trip.

OF ALL THE CARS IN SERVICE TODAY
MORE THAN HALF ARE FAIRMONTS

Check your other bumping posts against the 12 items below all of which are built into this Type WD

Only the Hayes Type WD Bumping Post has these features:

1 One size of post fits any rail from 5 to 7 inches high.
2 The whole post is shipped and erected in two pieces.
3 Installation is a quick job for two men.
4 Only eight holes to drill and these for 1 inch bolts.
5 After the holes are drilled in the right locations there is no way in which the post can be put up wrong.
6 There are only ten nuts to tighten in the entire post.
7 Not a cast-iron head but a steel head, one piece with the whole compression unit.
8 Compression H beams with four times the strength of the compression members in other posts.
9 Chrome-nickel track bolts having double the strength of ordinary bolts.
10 Front and rear cross-channels of heavy section hold the rails to gage and prevent them from turning.
11 Ample clearance for metallic hose connections.
12 Provision for middle rails to make a firm track foundation for the post.

Hayes Track Appliance Co., Richmond, Indiana

REPLACE OLD TRESTLES this quick, economical way

Replacing a 50-foot trestle on a main line railway with 200 feet of 10-foot diameter Armco Multi Plate Pipe.

START NOW to eliminate fire hazards and excessive maintenance costs, by replacing those old trestles with Armco Multi Plate.

Only a few days are required to erect the plates and bolt them together on the job. There's no delay to traffic. No power equipment is needed. And the finished structure can immediately be backfilled.

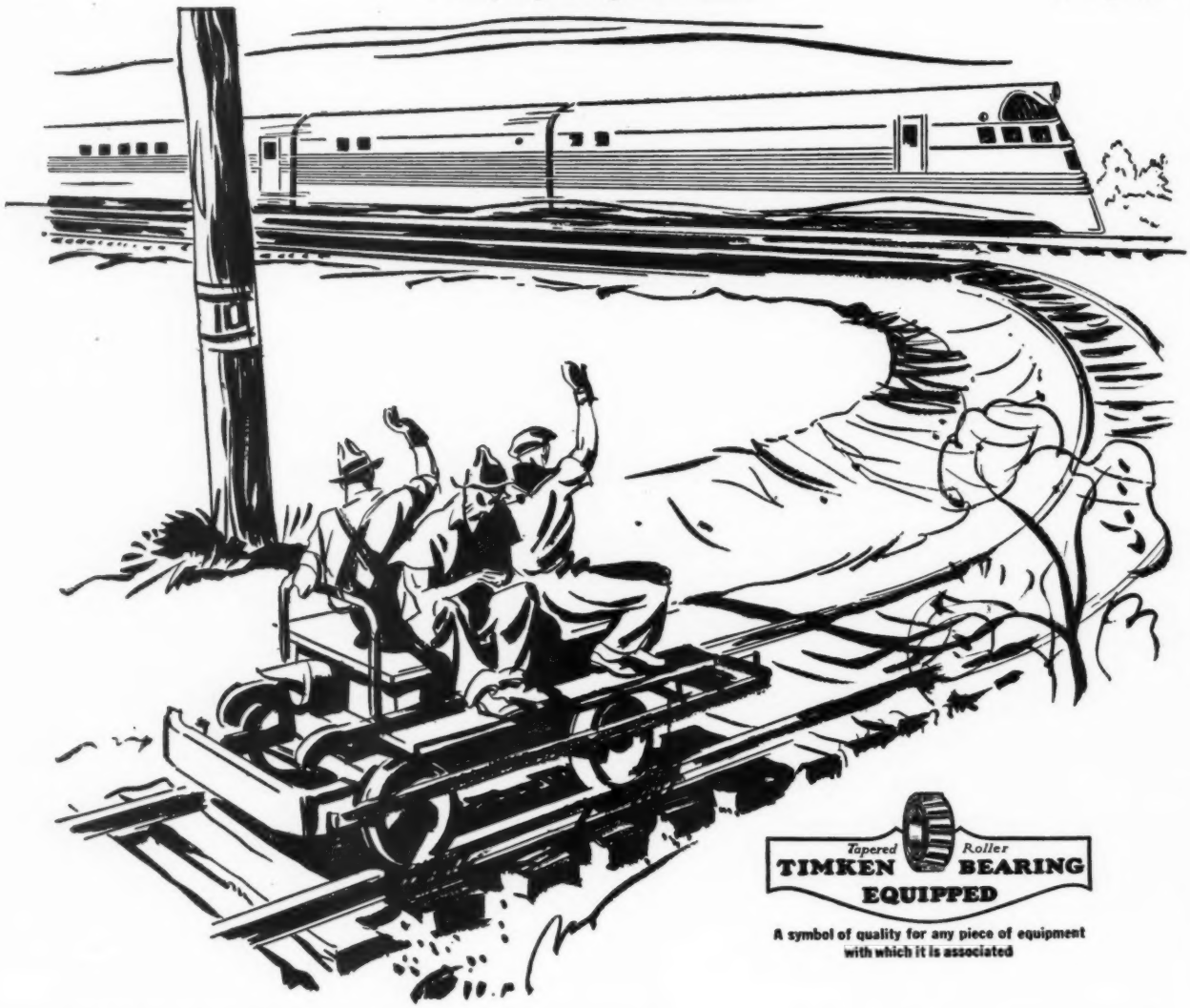
Thousands of Armco Multi Plate structures are serving efficiently under fills ranging up to a depth of more than 80 feet. And since the heavy gage plates are made of rust-resisting ARMCO Ingot Iron, Multi Plate should last a lifetime.

Call or write our nearest office for specific, helpful information. Ingot Iron Railway Products Co. (member of the Armco Culvert Mfrs. Assn.), Curtis Street, Middletown, Ohio; Atlanta, Salt Lake City, Los Angeles, Minneapolis, Spokane, St. Louis, Richmond, Portland, Philadelphia, Dallas, Houston, Denver, Chicago, Cleveland, Berkeley, Calif.

MULTI ARMCO PLATE

ARMCO MULTI PLATE

A PRODUCT ORIGINATED AND DEVELOPED BY ARMCO ENGINEERS



Tapered Roller
TIMKEN BEARING
EQUIPPED

A symbol of quality for any piece of equipment with which it is associated

MODERN—Timken Bearing Equipped

8 Budd-built Zephyrs are now rolling on TIMKEN Bearings.
Glide—as you ride a Timken-equipped Train

In modern section motor cars, where speed, strength and endurance must be combined with compactness and light weight, TIMKEN Bearings are necessary for maximum operating efficiency and economy.

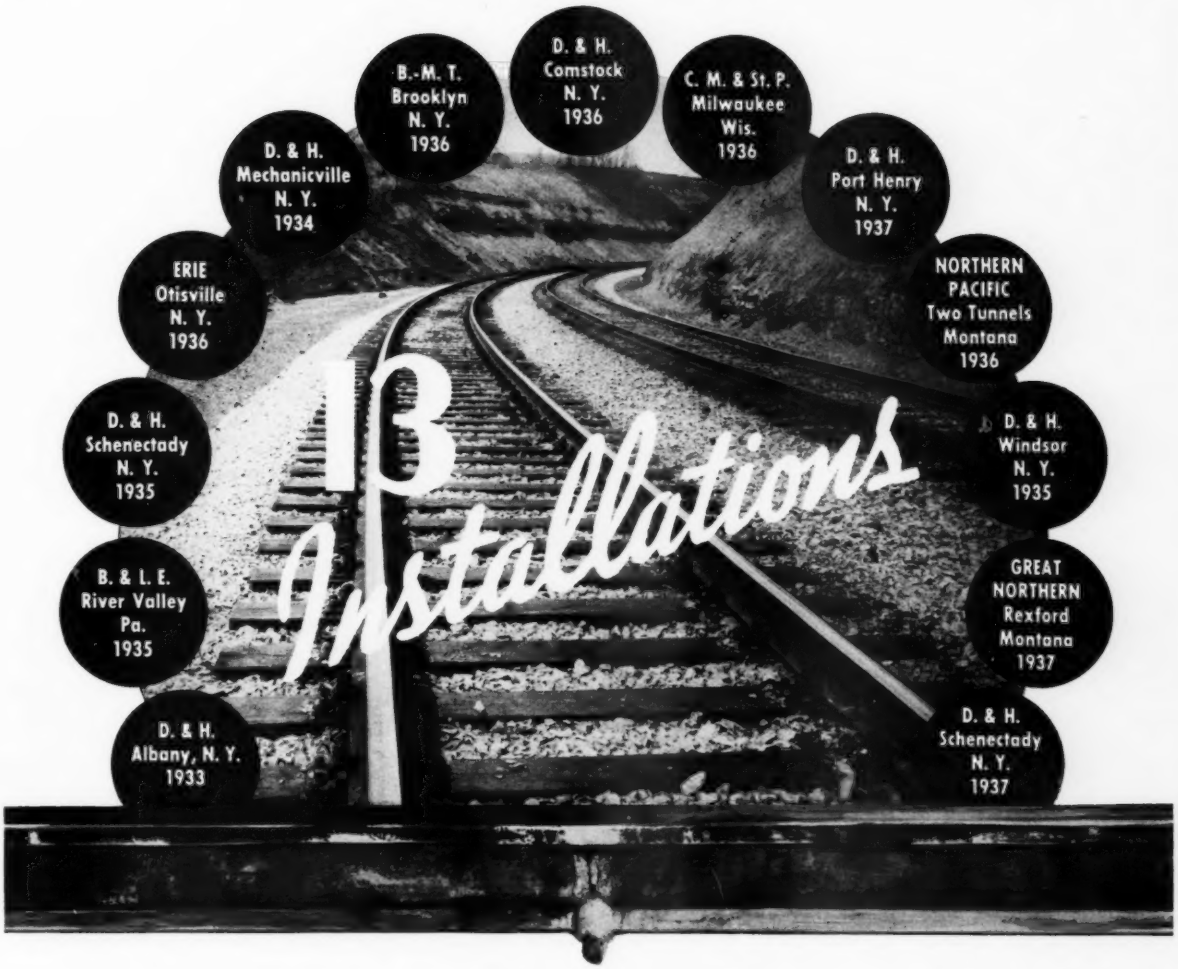
By reducing friction to the vanishing point on motor crank shafts and wheel axles TIMKEN Bearings extend motor power and save fuel and lubricant. Through their capacity to carry radial as well as thrust and combined loads they extend car life and cut operating maintenance costs.

Today's modern streamlined trains use TIMKEN Bearings to all the above advantages. The buyers of modern section cars may well take a cue from the performance of the streamliner—specify "Timken Bearing Equipped."

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; Timken Rock Bits; and Timken Fuel Injection Equipment.

TIMKEN
TAPERED ROLLER BEARINGS


13 Installations
B.-M. T. Brooklyn N. Y. 1936
D. & H. Comstock N. Y. 1936
C. M. & St. P. Milwaukee Wis. 1936
D. & H. Mechanicville N. Y. 1934
D. & H. Port Henry N. Y. 1937
ERIE Otisville N. Y. 1936
NORTHERN PACIFIC Two Tunnels Montana 1936
D. & H. Schenectady N. Y. 1935
D. & H. Windsor N. Y. 1935
B. & L. E. River Valley Pa. 1935
GREAT NORTHERN Rexford Montana 1937
D. & H. Albany, N. Y. 1933
D. & H. Schenectady N. Y. 1937

SAY THIS JOINT CAN TAKE IT

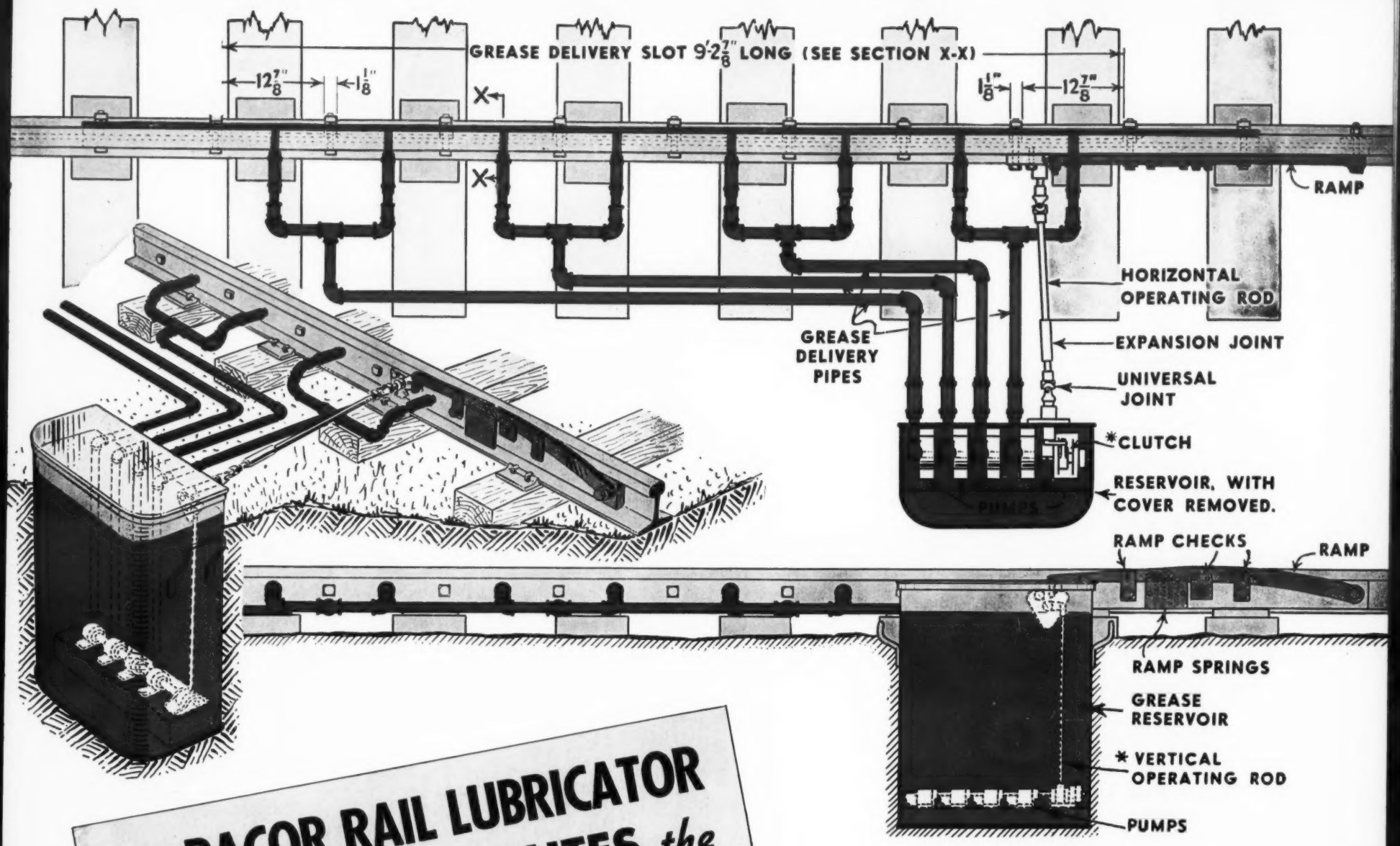
THIRTEEN installations of long, continuous rail with every joint Thermit welded . . . including the original "Velvet Track" of 1933 . . . prove that the Thermit Rail Weld can stand the gaff. Thermit Welded rails up to seven thousand feet in length are now giving good accounts of themselves in main line service on the Erie, the Brooklyn-Manhattan Transit, the Chicago, Milwaukee & St. Paul, the Northern Pacific, the Great Northern and, in several locations on the Delaware & Hudson.

The reason why Thermit Rail Welds can take it lies in the very nature of the Thermit process. Thermit Welding provides an ideal weld . . . one in which there can be no slag inclusions; no burning of the welded surfaces.

With authorities agreeing that nearly fifty per cent of track maintenance can be saved by eliminating rail joints, you will want full data on the Thermit Weld. You will be interested, too, in learning how small and portable the equipment is, and how simple the procedure. Your own track forces can be trained quickly to do the work. Write for complete information.

THERMIT Rail WELDING

METAL & THERMIT CORPORATION, 120 BROADWAY, NEW YORK, N. Y.
ALBANY • CHICAGO • PITTSBURGH • SO. SAN FRANCISCO • TORONTO



The RACOR RAIL LUBRICATOR DISTRIBUTES the GREASE

* NOTE — VERTICAL OPERATING ROD OPERATES GEAR PUMPS ON SPRING ACTUATED LIFT MOTION ONLY.

ON SPRING ACTUATED LIFT
MOTION ONLY.

Right AMOUNT *of* GREASE IN THE RIGHT PLACE

Extensive tests over a period of years have demonstrated that the Racor Rail Lubricator will apply more square inches of grease to the side of the rail head on curves and waste less grease along the right-of-way.

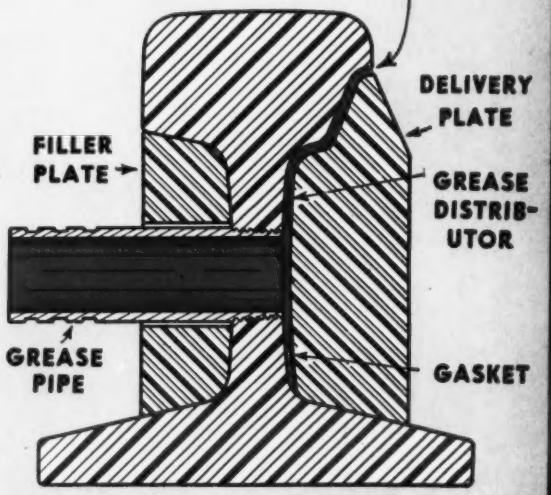
Here's How It Works

Four gear pumps, actuated by a ramp, deliver the lubricant through eight grease pipes to the chamber between the delivery plate and the rail, shown in section X-X.

Distributors on the delivery plate deflect the lubricant so that it is forced out of the delivery slot in a continuous line. The grease is thus picked up by the side of the flange in such a manner that the flange retains the maximum amount of lubricant on the surface coming in contact with the high rail of a curve and a minimum amount is wasted.

The operating parts of the Racor Rail Lubricator are of substantial construction, with flexible connections, and require only periodical inspection to see that the grease reservoir is filled and the few operating parts exposed to the weather are kept oiled.

GREASE DELIVERY SLOT 9'-2⅞" LONG DIVIDED INTO 8 DELIVERY SPACES (EACH 12⅞" LONG) BY SHIMS AT BOLTS WHICH MAINTAIN THE WIDTH OF DELIVERY SLOTS ACCURATELY.



SECTION X-X

RAMAPO AJAX

Division of

The American Brake Shoe and Foundry Company

CANADIAN RAMAPO IRON WORKS, LTD.

RACOR TRADE MARK REGISTERED

General Offices

230 PARK AVENUE, NEW YORK

Racor Works

CHICAGO, ILL.	LOS ANGELES, CALIF.	PUEBLO, COLO.
EAST ST. LOUIS, ILL.	NIAGARA FALLS, N. Y.	SEATTLE, WASH.
HILLBURN, NEW YORK	NIAGARA FALLS, ONT.	SUPERIOR, WIS.

TO RAILWAY SUPPLY MANUFACTURERS

THE railways are rapidly becoming machine-minded.

They purchased more than 3,400 units of mechanical equipment for maintenance of way work last year.

They spent more than $5,000,000 for this equipment in the one year.

Of this equipment 67 per cent was purchased from 23 manufacturers who advertised during the year in Railway Engineering and Maintenance, an average of 100 units per advertiser.

The remaining 33 per cent of the equipment was purchased from 108 non-advertising manufacturers, an average of 10 units per manufacturer.

The manufacturer who is getting the business keeps his product before his customers. It pays.

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

Forget that spike pulling problem

It can be done with this machine on the job

It is an easy task for Spike Pullers to keep ahead of your rail laying gang.

With increased rail laying programs, it is more necessary than ever that the various operations be done quicker and at less expense. Pulling spikes by hand often holds up the entire gang and impedes progress. Such delays need not occur with Nordberg Spike Pullers on the job. This is being proved on most of the country's leading railroads. Those who have set records for rail laying have mechanized their track gangs with Spike Pullers and other Nordberg Power Maintenance Tools.

Nordberg Power Tools For Your Track Jobs

Adzing Machine
Track Wrench
Rail Drill
Spike Puller
Power Jack
Rail Grinders
Track Shifter

NORDBERG MFG. CO., MILWAUKEE WISCONSIN

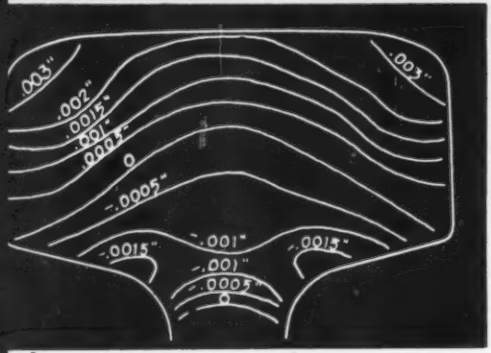
44 Whitehall St., New York, N. Y.

Foreign Representative: WONHAM, INC.

68-72 Windsor House, London, S.W.1.

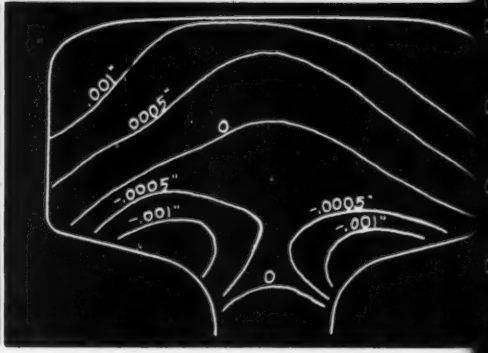
Now A BETTER

. . . and here's proof!



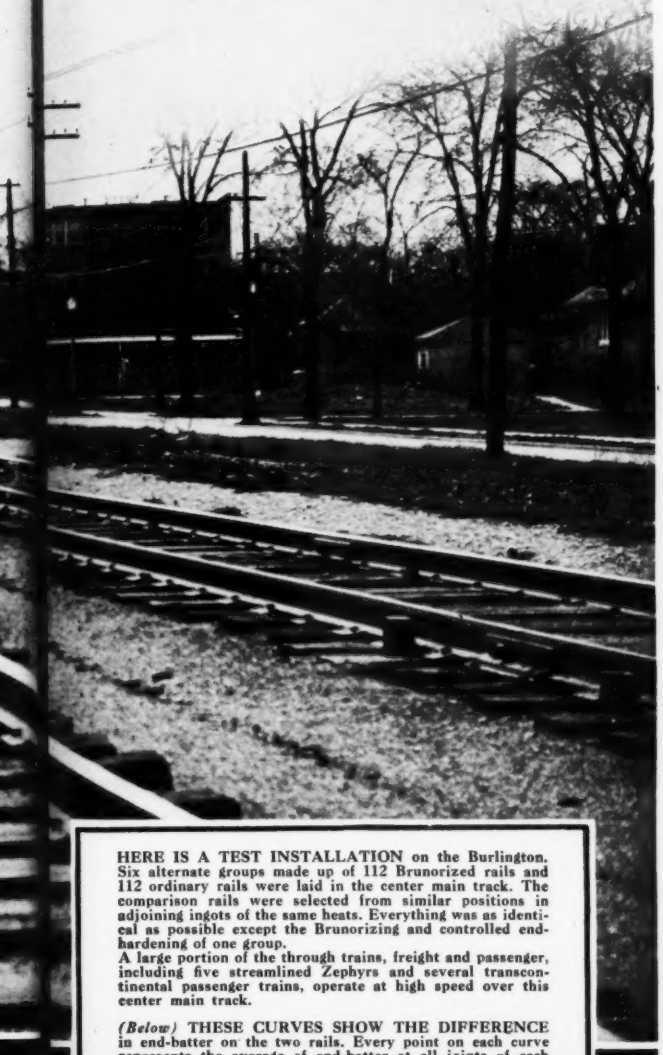
ORDINARY RAILS

THESE STRESS DIAGRAMS were made by sawing the rail ends into small transverse sections and measuring the expansion of the little section as it was released from the neighboring metal. Each .001 inch of length increment corresponds to 3,000 pounds per square inch of internal stress. They clearly indicate that the U·S·S Brunorized Rail is much more free of internal stresses.



BRUNORIZED RAILS

STEEL RAIL



HERE IS A TEST INSTALLATION on the Burlington. Six alternate groups made up of 112 Brunorized rails and 112 ordinary rails were laid in the center main track. The comparison rails were selected from similar positions in adjoining ingots of the same heats. Everything was as identical as possible except the Brunorizing and controlled end-hardening of one group.
A large portion of the through trains, freight and passenger, including five streamlined Zephyrs and several transcontinental passenger trains, operate at high speed over this center main track.

(Below) THESE CURVES SHOW THE DIFFERENCE in end-batter on the two rails. Every point on each curve represents the average of end-batter at all joints of each type of rail, carefully measured by the A.R.E.A. method.

New U·S·S Brunorizing Process Lengthens the Average Life of Rails

THERE are two outstanding reasons why the new U·S·S Brunorized Rail is a better rail.

After the usual rolling operations it goes through two new treatments—two new metallurgical processes designed to strengthen its resistance to the two most common causes of rail replacement.

The first is Brunorizing. This is a special normalizing treatment of the entire rail under controlled conditions of time and temperature. The purpose is to refine the grain structure, to reduce grain size, to increase ductility, to relieve internal stresses, to remove the causes of "rail cancer" (shatter cracks and incipient fissures).

The second is improved end-hardening. This is a controlled and automatic air-quenching of the hot ends by specially formed air jets controlled by electric timing. The result is uniformly high end-hardness smoothly grading into the normal hardness of the rail.

When "christened" last February the U·S·S Brunorized Rail was already three years old. As far back as 1934, 32 test installations were laid on 23 major railroads. At most test locations, each rail joint was numbered and observed and measured at frequent intervals. At every location, these tests under service have confirmed laboratory indications . . . have demonstrated that this new rail shows no tendency to develop fissures and that it reduces costly end-batter by 50-60%.

Every evidence—both in the laboratory and in the track—indicates that the U·S·S Brunorizing Process will materially lengthen the life of steel rails.

U·S·S BRUNORIZED RAILS

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

No. 109 of a series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION
105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: A Breathing Spell

January 1, 1938

Dear Reader:

I overheard a conversation between two railway supply manufacturers a few days ago that I believe will be of interest to you, dealing as it does with your present activities.

"I'm not going to spend a dollar for railway sales until after the rate decision is handed down," I heard the first manufacturer say.

"Why do you say that?" his companion inquired.

"Because," the first speaker replied, "the railways are not buying anything now and they will not buy until they know what increases in rates they will be allowed."

"You're only partly right," his companion countered, "for I'm getting some business, although I will concede that it's less than normal for this season. I suppose you're laying off your salesmen, too."

"No," replied the first speaker, "but I am keeping them off the road and saving their traveling expenses."

"You're all wrong," replied his companion, "and I'll tell you why. It's true that railway earnings are now at a low ebb by reason of increasing expenses. But it's equally true that the railways are going to get a large part or all of the 15 per cent increase in rates that they have requested. You must have noted that the shippers who will pay the bill recognize the importance of efficient transportation and the justice of the railways' claims and are presenting little opposition to the increase. Several business prognosticators estimate that they are going to get at least 12 1-2 per cent. This will increase their income by $400,000,000 or more. Just as soon as they get this decision, they will rush into the market for a lot of materials and equipment they will need for next spring's programs. With this prospect, what do you suppose these railway officers are doing now?" he asked.

"I don't know," his friend replied, "taking it easy, I guess."

"You're wrong again," his companion continued. "They're as busy as beavers, working over their programs, gathering additional information, and, in fact, making out requisitions so that when the rate increase is handed down late in February or early in March, they will be all set to go. They know that the working season will be so close on them that there will then be no time left to make decisions or to select materials – and if you expect your men to start out then for business, they will be just too late. In fact, many of these railway officers will then be too busy getting their programs started even to talk to your men."

"If you feel that way, what policy are you following in your sales?" asked the first manufacturer.

"I'm doing the exact opposite of you," his friend replied. "I'm continuing and increasing my advertising and I'm keeping my men on the road. They're telling our story to these railway men while they are actually working on their programs and are eager for information and while they have time to listen. And I know that our products are going on requisitions, for I am seeing them – and we are receiving many inquiries for prices, etc., with warnings to be prepared to make prompt shipments when the rate increase comes through. We are putting in our best licks now, confident that we are going to come through in the spring. This breathing spell among railway maintenance officers is our opportunity and we are utilizing it to the limit of our ability."

"Perhaps you are right," replied the first friend.

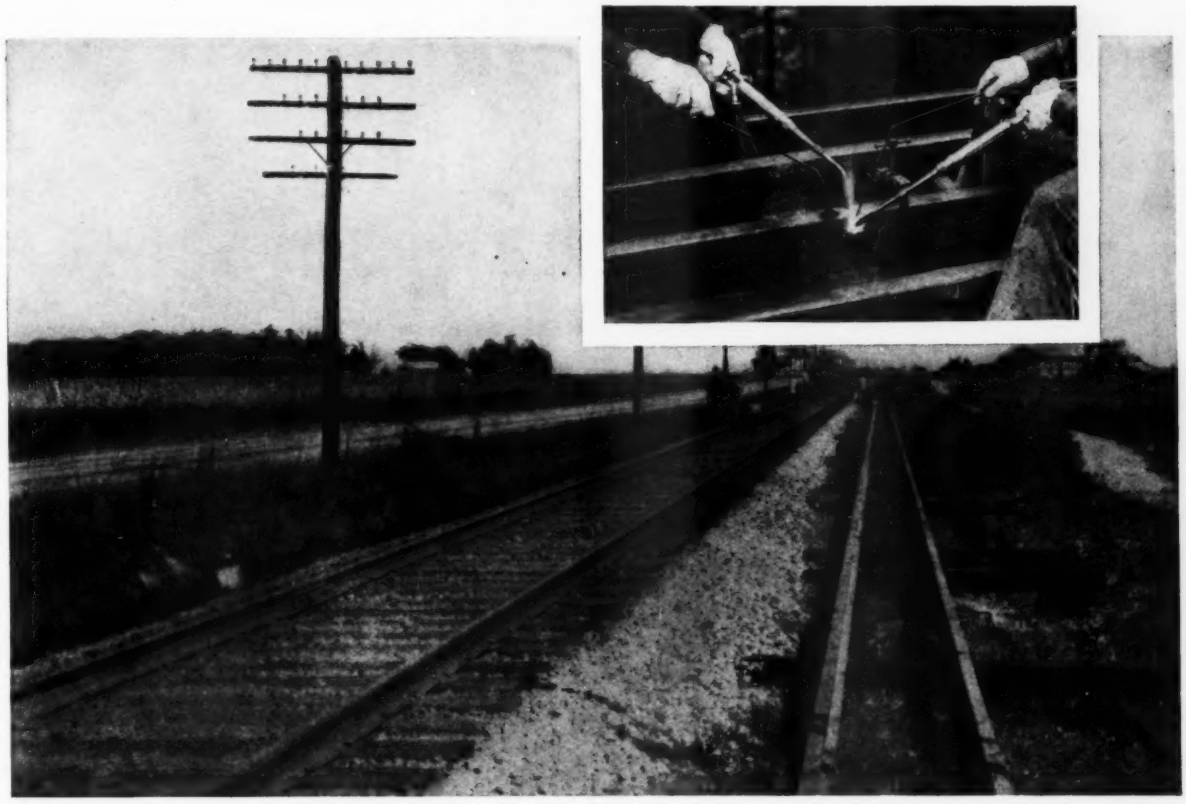
What do you think?

Yours sincerely,

Elmer T. Howson

ETH:EW Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.



Oxweld Procedure Assures Low Costs for Continuous Welded Rail

BUTT-WELDED rail having good tensile strength and high impact resistance is produced under Oxweld procedure. Many factors combine to make the cost of butt-welding rail under this procedure unusually low.

Oxweld engineers train the railroad's welding operators in the approved Oxweld method, co-operate in the proper crew organization, and supervise the application of this process.

Since standard apparatus, which is furnished by The Oxweld Railroad Service Company to its customers, is employed in butt-welding, no special investment in apparatus is required.

In butt-welding the Oxweld way, the railroad's regular rail-end welding crews are generally employed, making it unnecessary to provide additional or special crews for this work.

Oxweld clients can effect maintenance economies and obtain smooth-riding track at low cost by installing butt-welded rail under Oxweld procedure. Now, as in the past, The Oxweld Railroad Service Company stands ready to assist its railroad customers in the production of continuous rail on current or proposed rail-laying projects.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation

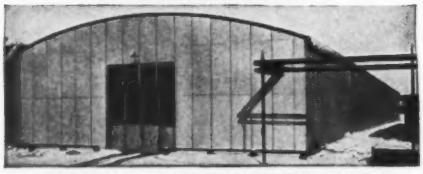
New York: Carbide and Carbon Building
UCC
Chicago: Carbide and Carbon Building

OXWELD RAILROAD SERVICE

SINCE 1912
OVER A QUARTER CENTURY OF SERVICE
TO THE MAJORITY OF CLASS I RAILROADS

RAILROAD BUILDINGS SURVEY REVEALS MANY ADVANTAGES OF TRUSCON STANDARD BUILDINGS

TRANSFER SHEDS



PERISHABLE FOOD WAREHOUSES

SHOP BUILDINGS

BUNK HOUSES

PLATFORM CANOPIES

STORES DEPARTMENT BUILDINGS

TIME QUESTION . . . What is the comparison of time of erection of a Truscon Standard Building with other permanent types of comparable size and arrangement?

ANSWER . . . Less time is required because Truscon Standard Units are shop fabricated and delivered to job ready for immediate erection.

DESIGN QUESTION . . . What is the scope of selectivity provided by Truscon Standard Buildings?

ANSWER . . . You can select any type and size of building having any arrangement of doors and windows . . . any kind of sidewalls . . . and any type of roofs including flat, pitched and monitor types.

COST QUESTION . . . How does the cost of Truscon Standard Buildings compare with other types of permanent structures of comparable size and arrangement?

ANSWER . . . Truscon Standard Buildings cost less because all units are shop fabricated on a modern production basis for quick erection with resultant savings in costs of materials and labor.

MAINTENANCE QUESTION . . . How do Truscon Standard Buildings compare with any other types of permanent construction of comparable size in respect to maintenance costs?

ANSWER . . . Truscon Standard Buildings require a minimum of maintenance to insure long life. Custom-built from rust-resisting copper alloy steel units and equipped with a base panel of Republic ENDURO stainless steel, every Truscon Standard Building is safeguarded for greatest durability under all conditions.

SALVAGE QUESTION . . . If it is ever required to change the location of a Truscon Standard Building, what is the potential salvage value of the entire structure?

ANSWER . . . Truscon Standard Buildings can be dismantled completely . . . moved to any new location . . . and re-erected with practically 100 per cent salvage value.

OTHER QUESTIONS . . . Where quick action is necessary to secure specific information about all details pertaining to a definite requirement, what is the procedure?

ANSWER . . . Write, wire or telegraph direct to Truscon Steel Company at Youngstown, Ohio, if you do not know the location of the nearest Truscon sales-engineering office. (There are 57 Truscon sales-engineering offices located strategically in the United States.)

TRUSCON STEEL COMPANY
YOUNGSTOWN . . . . OHIO

SUBSIDIARY: REPUBLIC STEEL CORPORATION

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Railway Engineering and Maintenance

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JANUARY, 1938

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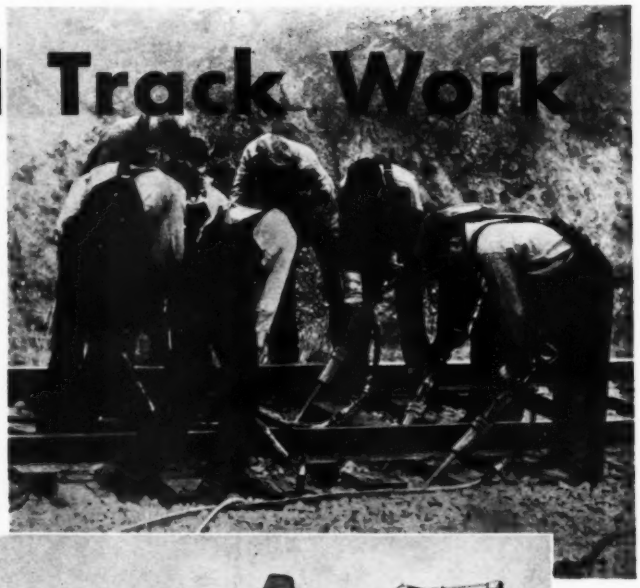

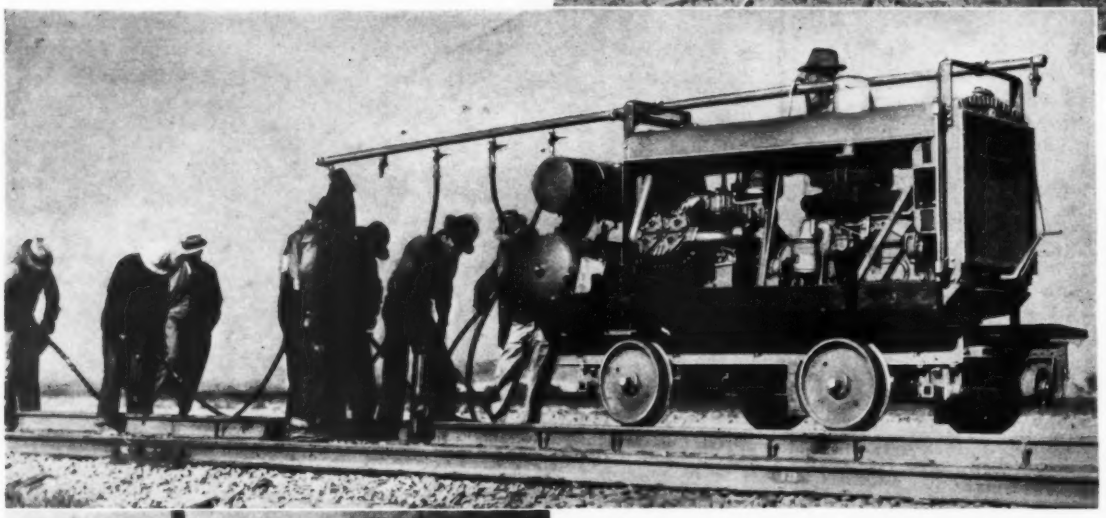

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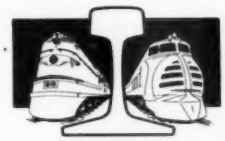
Railway Engineering and Maintenance



1937

A Year of Promise

THE first half of the year that ended on December 31 was one of promise, during which much of what had been promised was achieved; the last three months were a source of disappointment, if not genuine anxiety. However, insofar as maintenance of way and structures is concerned, the record of the year, when considered in the light of what had occurred in previous years, proved one fact beyond any question—namely, that, assured a volume of business which offered a reasonably safe margin of net earnings, the managements will allot increasing sums for the maintenance of the fixed properties—that, given a chance, they will increase appropriations to a point that will assure real progress in restoring the tracks and structures to the high standards that prevailed before the onset of the depression.

The year began with a healthy increase in business over that of the previous year. During the first three months total revenues were 13.6 per cent greater than for the corresponding period of 1936. During the next three months the increase fell to 9.4 per cent, during the third quarter it amounted to only 2.9 per cent, while in the last quarter the revenues were 10.1 per cent less than for the last three months of 1936. However, in spite of this pronounced drop in earnings, maintenance of way operations suffered little decline below the normal seasonal drop until after the end of September, and the decrease in the subsequent months was in a smaller ratio than the decline in earnings.

The Year's Record

Taking the year as a whole, the record of the railways may be summarized as follows:

Freight traffic (ton miles) increased 6.7 per cent over 1936, as compared with an increase of 17.7 per cent the previous year. It was 51 per cent larger than in 1932, although still 17 per cent below the 1926-30 average.

Passenger traffic (passenger miles) increased 10.8 per cent over 1936, as compared with an increase of 19.1 per cent the year before. It was 50 per cent heavier than in the low year of 1933, although still 38 per cent below the average for 1926-30.

Operating revenues increased 3.3 per cent during the year, as compared with an increase of 16 per cent in 1936. Operating expenses increased 6.7 per cent; in 1936 they increased 12.8 per cent.

Net railway operating income approximated $590,000,000, a decrease of $77,000,000, or 11.6 per cent, under 1936. It was $279,000,000 below 1930 and $525,000,000 below the average for 1926-30.

The net income after fixed charges is estimated at $85,000,000 as compared with $165,000,000 in 1936 and with net deficits in 1932, 1933 and 1934.

Receiverships

There was little change in the status of the railroads with respect to receiverships; 96 companies with 71,386 miles of line were in the hands of the courts at the end of 1937, compared with 93 companies and 70,062 miles at the beginning of the year. However, the mileage now in the hands of receivers is the greatest in the history of American railroads.

Purchases of materials and supplies from the manufacturing industry totaled $846,000,000, an increase of $97,000,000, or 13 per cent over 1936. This was a larger total than in any year since 1930.

Turning to operating indices, the operating ratio for 1937 was 74.8 as compared with 72.3 in 1936 and 74.4 in 1930.

The average speed of freight trains between terminals, was 16. 1 miles per hour, as compared with 15.8 in 1936, and with 16.0 in 1935, the highest previous record.

The average movement per "active" freight car (excluding stored or surplus equipment) per day during 1937 was 40.9 miles per day as compared with 39.7 miles in 1936.

Net ton miles per freight car per day increased to 578 in 1937 from 519 in 1936. Net ton miles per train-hour broke all records, with a total of 12,833 in 1937, compared with 12,139 in the previous year.

The number of railway employees averaged 1,118,000 in 1937, compared with 1,065,624 in 1936.

Maintenance Expenditures

The expenditures for maintenance of way and structures in 1937 amounted to about $493,000,000, which, as seen in the accompanying table, is larger by $38,000,000 than the outlay in 1936, and exceeds the expenditure

for the low year—1933—by $171,000,000 or 53 per cent. Compared with pre-depression years, say, 1925 to 1929, inclusive, the expenditures in 1937 were still low, amounting to 58 per cent of the five-year average. But this comparison does not afford a true picture of the level of maintenance operations during the active season of 1937, because of the effect of the curtailment of activities during the last three months.

Thus, making the comparison of expenditures on a monthly basis, since this eliminates the effect of seasonal variations in the volume of the work, we find that the expenditures for the first 9 months of last year were at the rate of 60 per cent, compared with the five predepression years, the corresponding figures being 53.5 per cent for the entire year of 1936, 46.3 per cent for 1935 and 36.8 per cent for 1933. Considering individual months, but excluding those affected by such emergencies as floods or widespread winter storms, we find that there were four months in 1937 when the expenditures exceeded 60 per cent of the five-year average, whereas in 1936 there was only one month when the rate was even slightly above 55 per cent, and in 1935 the rate was less than 50 per cent in every month.

Maintenance Expenditures (1917-1937)

1917	$ 442,108,862	1928	$ 837,905,747
1918	649,794,953	1929	855,354,867
1919	772,186,045	1930	705,470,940
1920	1,032,540,381	1931	530,612,890
1921	756,413,690	1932	351,179,041
1922	728,663,534	1933	322,335,022
1923	813,688,760	1934	365,285,353
1924	792,678,023	1935	393,642,261
1925	816,443,205	1936	454,842,407
1926	866,819,365	1937*	493,000,000
1927	868,581,432		

*Last two months estimated.

It is clearly evident, therefore, that expenditures were definitely on an appreciably higher level throughout most of the last year. In fact, if the expenditures for the entire year had been proportional to those for the first nine months, making due allowance for the normal seasonal decline, the total outlay for the year would have exceeded the expenditures for 1936 by more than $50,000,000 instead of $38,000,000.

The Present Situation

Although appropriations for the upkeep of the physical properties since the bottom of the depression have increased at a remarkably steady rate, with due allowance for normal seasonal variations, there is no warrant for the conclusion that expenditures in recent years, taking the railroads as a whole, have been effective in making good more than current wear and tear. As a consequence, the large volume of deficiencies in maintenance that accrued during 1931 to 1935, inclusive, comprises a stern physical fact that still confronts the managements of the railroads. What this amounts to in actual figures is difficult of exact determination, but a careful study points to a sum of the order of a billion dollars.

Like total expenditures, the outlays for rails and ties, have also increased measurably since the depth of the depression was reached. As shown in the tables, the rails laid in replacement in 1937 amounted to about 1,030,000 gross tons, compared with only 394,536 tons in 1932, while the number of crossties used in renewals in 1937 was about 48,000,000, as contracted with 37,295,716 ties in 1933. But these increases appear small when compared with the marked drop in renewals that occurred between 1929 and 1932-33. This is clearly shown by the two tables.

Because of the decrease in wear resulting from a smaller volume of traffic, because of improved technic in the care of rail and ties, the use of increasing proportions of treated ties, as well as other factors, the accrued deficiencies in rail and tie renewals cannot be determined by a direct comparison between the replacements during the depression years and those made in the years immediately preceding. But even a most conservative analysis points to large deficiencies—some 3,000,000 tons of rail and around 90,000,000 crossties.

Rails Laid in Replacements, Class I Railroads

	Gross Tons		Gross Tons
1925	1,950,146	1932	394,536
1926	2,209,873	1933	403,254
1927	2,124,765	1934	631,093
1928	2,080,277	1935	582,794
1929	1,958,489	1936	921,298
1930	1,517,002	1937	1,030,000*
1931	984,900		

Other Deficiencies

Because the effectiveness and safety of railway operation are influenced much more directly by the condition of rails and ties, and bridges and culverts, these and similar items of the properties have received much more attention than those elements of the properties that can be neglected without adversely affecting the movement of trains. Buildings, and the painting of all structures, for example, have suffered much more neglect. Therefore, while deferred rail and tie replacements represent the equivalent of about three years and two years, respectively, of the current rates of renewals, the amount of money that would have to be spent to take up the accrued deficiency in the upkeep of some of the other elements of the fixed properties would represent several times as much as has been spent annually for some years.

Crossties Applied in Renewals, Class I Roads

1925	82,716,674	1932	39,190,473
1926	80,745,509	1933	37,295,716
1927	78,340,182	1934	43,306,205
1928	77,370,491	1935	44,351,900
1929	74,679,375	1936	47,361,015
1930	63,353,828	1937 (estimated)	48,000,000
1931	51,501,659		

A Record of Progress

The history of the American railroads is one of progress toward greater effectiveness as an instrumentality for national transport, but at no time during the 100 years that mark the railroad era, has the progress been so marked as in the years that have immediately followed the passing of the worst period in the world's greatest economic depression. Born in the minds of a few courageous men, the conception of new standards for speed and service has kindled renewed enthusiasm among railway men and regained the goodwill and respect of the public. Improved rail transportation has given the properties a momentum that will carry them through many difficulties, and as time goes on will give rise to even further improvements in the fixed properties and the maintenance of still higher standards of perfection in tracks and structures.

Associations

Why There Are Three of Them

THE engineering and maintenance of way department is served by three associations—the American Railway Engineering Association, which meets annually in March in Chicago; the Roadmasters and Maintenance of Way Association, which meets annually in September, usually in Chicago; and the American Railway Bridge and Building Association, which meets annually in October, also usually in Chicago. These associations are all mature organizations, being 39, 52 and 44 years old, respectively. They enroll more than 3,000 maintenance officers in their membership, with an overlap of less than 5 per cent.

In the organization of these three associations and in the division of the work between them, conditions differ widely from those found in the nearest comparable field of railway service—the mechanical field—where no less than nine different organizations are functioning, with a correspondingly minute division of the field of activity.

The three engineering associations correspond with the major subdivisions of engineering and maintenance responsibility. They have long avoided duplication of work, but have so directed their activities as to supplement each other. Thus all questions of design and of the development of standards are handled by the A.R.E.A. as are studies of the economies of gang organization. The Roadmasters and the Bridge and Building associations concentrate, each in its field, on the methods of employing most efficiently the men and the materials allotted them. Theirs is the intensely practical consideration of problems growing out of their individual experiences. In the same way that there is a need in a railway organization for a chief engineer to plan and direct, and for a roadmaster and a bridge supervisor to execute the work, these three associations have grown up to serve the three groups and to aid them in solving their related but yet individual problems.

Furthermore, these associations have each developed the precedure best adapted to the needs of their own members. Thus the A.R.E.A. meets annually in March when outside construction and maintenance work is at the minimum and just prior to the launching of the active seasonal program. Likewise, the roadmasters and the bridge and building men meet in the autumn when the dangers of sudden storms and line interruptions are at a minimum, these latter two meetings also being so spaced that a member of either organization can backstop the other when he leaves his division.

Accompanying each convention and adding materially to its educational value is an exhibit of materials and equipment participated in by those companies which desire to bring their products to the attention of the men attending that convention. Thus a number of companies exhibit their products only at the time of the A.R.E.A. convention in March, while others exhibit at this convention and also at the Roadmasters *or* the Bridge and Building convention. These exhibits are conducted by organizations entirely independently of the railway associations and represent the united belief of the manufacturers joining therein that it is worth their while to participate. These exhibits afford many railway men attending the conventions opportunity to gain valuable information regarding the aids that are available to them in both materials and equipment.

By reason of these long records of constructive service, it is not surprising that all three of these organizations were permitted and encouraged to continue their activities during the period of federal control when the activities of most other associations were suspended. It is equally significant that the A.R.E.A. was one of the few railway organizations that was permitted to continue its activities throughout the recent depression and that the Roadmasters and the Bridge and Building associations were among the last to suspend and were the first to resume activities by direct authorization and encouragement of railway managements. That these organizations are continuing and increasing their records of constructive service to the railways is demonstrated by the testimony of men of varying degrees of responsibility in maintenance service which appear on page 30.

Such a record of service and of management approval thereof demonstrates a degree of leadership through the years that is to be commended. These associations, each independent in its direction, have done much to stimulate individual interest and initiative. Such interest should be perpetuated, looking to the continuation of this incentive to efficiency in the maintenance of the fixed properties of the railways.

A Survey

Of Work Equipment on the Roads

ON page 24 of this issue we present a tabulation of the mechanical equipment purchased by the various railways in 1937. This is the first list of its kind that has ever been compiled for publication. For this reason, we believe that it constitutes a service that will be welcomed by the railways and also by the manufacturers.

For the railway man, it provides information regarding the purchases of other roads and will be of aid to him in completing his program of future purchases. Especially will it be helpful to him in broadening his work equipment purchases by giving him knowledge of the judgment of others. For the manufacturer it demonstrates the magnitude and diversity of the field and affords him a measure of the receptivity of the field to equipment designed to meet its needs. It shows him also the roads that are "sold" on the advantages of work equipment and also those that are yet to be "sold."

The list is complete for all practical purposes, so far as the railways are concerned, for only one Class I road is missing. We believe that it is equally complete as to orders for the major units of work equipment, although it is possible that it is not so complete in its list of other units because of uncertainty on the part of the railways as to the classification of some of these units as work equipment. This uncertainty, if it exists, will be clarified when the blanks are sent out in succeeding years.

We trust that the tabulation will be interesting and helpful alike to user and builder of work equipment and that it will focus attention on the further economies possible through the more universal use of such equipment.

Large Motor Car Purchases

$5,000,000 for

Orders Placed by Different
Demand and Show

THE railways of the United States, Canada and Mexico purchased more than 3,310 units of work equipment during 1937 at a cost of more than $5,000,000. These purchases include more than 100 different types of equipment for an equally wide range of maintenance operations. The equipment ranges in size from pile drivers, locomotive cranes and large excavating machines to small portable power-driven tools for bridge and building work.

Both the magnitude and the diversity of these purchases demonstrate the progress that has been made in mechanization of maintenance of way work since it started practically from scratch little more than 20 years ago. Much of the progress that has been made in the development of better and more economical practices in maintenance in recent years can be traced directly to this equipment.

This compilation of work equipment purchases, which is made available here for the first time through the co-operation of the railways, constitutes the first measure of the use of equipment of this character. To obtain the information which is given in detail on the following pages, inquiry was made of all of the roads in the United States, Canada and Mexico, and replies were received from 533 railways, including all but one of the Class I roads.

One of the important facts disclosed by the replies is that the purchases of work equipment is highly concentrated as yet, for approximately 10 per cent of the roads purchased more than 90 per cent of the equipment that was sold in 1937. Another deduction to be drawn from the replies is that they point unmistakably to a growing use of work equipment, for not a few officers who advised as recently as two years ago that they were amply supplied and had no need for more equipment purchased a considerable number of units in 1937, in some cases of types they had not used previously, and, in others, to add to those already in use.

An Expanding Field

In other words, despite the large amount of work equipment already in use this is no criterion of its ultimate possibilities, for these data show that its use is still expanding and that it will continue to do so for some years as maintenance officers realize more fully the advantages of mechanizing their operations.

As yet, no road has all of the work equipment it needs. This is confirmed by the direct statements to this effect by many maintenance officers and by the fact, already mentioned, that certain officers who no longer than two years ago believed that they had enough are already buying more. Furthermore, as this expansion continues there will also be a large and stabilized demand for the replacement of worn-out and out-moded units and for repair parts.

There is a Well-defined Trend Toward the Use of Off-Track Equipment

While it is obvious that many of the units purchased in 1937 were for the replacement of worn-out or obsolete machines, the trend toward a wider use of work equipment is also shown by the number of units purchased by individual roads and by the further fact that there were large-scale purchases of types that have only recently become available, as well as of others which, while previously available, have only lately been applied in maintenance work.

Modernizing Equipment

The replies indicate also that there is a definite trend toward the modernization of existing equipment. The most outstanding of these indications is the number and character of the motor cars purchased, 1,714 being bought in 1937. This list includes a considerable number of heavy-duty cars, pointing to an increase in the number of large gangs. The large majority of these cars were, however, of the lighter designs, indicating the trend towards smaller section gangs.

Another indication of this trend towards the modernization of work equipment, as well as of a wider use of this type of equipment, is the fact that 261 tie tamper outfits (large and small) were purchased by 41 roads last year, this being in addition to a large number of individual tie-tamping tools which were also purchased to replace worn out equipment or to substitute for older designs. There is also evidenced a movement toward the extension of the use of this equipment through the purchase of lighter units. suitable for use by gangs too small to warrant the assignment of the larger and heavier outfits.

That more attention is again being paid to the appearance of the right of way, the roadbed and the track than was true a few years ago is shown by the purchase of 92 weed-destroying units, including mowing machines with rail mounting, weed burners, ballast discers and scarifiers, and one chemical spraying car. In addition,

148 Bolters Were Bought

Work Equipment

Roads Demonstrate Magnitude of Numerous Trends

a number of mowers were purchased for use with tractors, as well as a considerable number of fire extinguisher cars for operation in connection with the weed burners. Incidentally, several of the heavy-duty motor cars were purchased specifically for pulling the fire-extinguisher cars.

Few Cranes Purchased

Although cranes have been in use longer than most types of work equipment except pile drivers, few roads have as many as they require for the effective prosecution of maintenance work. Furthermore, most of those they do own are obsolete in design, and many of them are approaching the end of their service life. Information obtained year by year from maintenance officers has shown that there is a large unfilled need for this equipment, including rail, locomotive and off-track types. With the general adoption of heavier rail, it has become impracticable to lay it economically without the use of cranes, for which reason equipment designed specially for this service has come into widespread use. However, like other cranes, most of those in rail-laying service are old and need to be replaced with units of more modern design. In view of this situation, it is surprising, considering the total number of units of all types of work equipment that were purchased in 1937, that only 26 rail cranes and only 17 of all other types were purchased by the railways.

Indicating a marked trend toward a wider use of small power tools, particularly in bridge and building work, the railways purchased 64 air compressors and 17 electric generators in 1937. Some of the air compressors went to replace worn-out units or those of less efficient designs, but the generators and an appreciable number of the air compressors were for new applications, as is shown by the number of wood-working tools, cleaning tools, etc., which were purchased. In view of the insistent demand for greater economy in maintenance, it is obvious that the railways cannot continue to do by hand those tasks which can be done better and cheaper through the use of these small power tools, for which reason there is a large potential need for both the tools and the power units to operate them.

Evidence of the changes which are taking place in maintenance methods is seen in the purchase of 148 bolt tighteners. While some of these were intended for use with rail gangs, most of them were bought for assignment to specially-organized bolt tightening gangs which work progressively over entire districts or divisions to relieve the section forces of the routine task of tightening bolts by hand.

Tractors Find Favor

Tractors are another type of equipment that is only now coming into wide use. Tractors, of themselves, are of little use in maintenance, but when accompanied by secondary devices such as graders, mowers, sweepers, bulldozers, snow loaders, welding units, etc., they exhibit a versatility possessed by few other types of work equipment. It is not surprising, therefore, that in buying 29 tractors in 1937, the orders included a large amount of incidental equipment of the types mentioned. In addition to these 29 tractors, a number of the welding generators, air compressors, etc., were tractor-mounted to give them the desired mobility.

Indicative of the reviving interest in maintenance painting, 35 paint spraying outfits were purchased in 1937.

Still another trend is evidenced by the growing use of highway vehicles in maintenance. Motor trucks have been employed more or less sporadically for several years to distribute materials in congested terminal areas. More recently, however, this practice has been extended to sections removed from terminals and in 1937 the railways purchased 108 trucks, mainly for use out on the line.

The detailed list of work equipment purchased by the railways in 1937 follows:

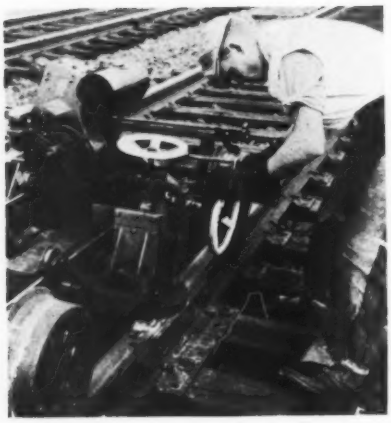
Alaska
- 10 Motor cars, section

Alton
- 1 Air compressor
- 2 Bolt tighteners
- 2 Drills, close quarter
- 1 Jackhammer
- 1 Mowing machine
- 1 Paving breaker
- 2 Pumps, centrifugal

Atchison, Topeka & Santa Fe
- 2 Adzing machines
- 24 Air compressors
- 1 Ballast cleaner
- 10 Bolt tighteners
- 8 Cranes, rail
- 5 Jacks, power
- 122 Motor cars, section
- 9 Motor cars, heavy duty
- 79 Motor cars, inspection
- 4 Shovels, power
- 2 Weed burners
- 1 Spike puller

Atlanta & West Point
- 1 Discing machine
- 2 Flange lubricators
- 3 Motor cars, section

Track Surfacing Offers a Large Field for Power Tools



Grinders Were Also Listed

Atlantic & North Carolina
1 Crane, rail
1 Weed burner

Atlantic Coast Line
3 Welding outfits

Baltimore & Ohio
5 Air compressors
9 Adzing machines
12 Bolt tighteners
4 Cranes, crawler
2 Grinders, rail
2 Grinders, bit
25 Motor cars, section
9 Motor cars, heavy duty
15 Motor cars, inspection
2 Mowing machines
8 Tie tamping outfits
1 Welding outfit

Bangor & Aroostook
1 Concrete mixer
5 Motor cars, section
1 Motor car, inspection
1 Pump, centrifugal

Belt Railway of Chicago
1 Air compressor, crawler mounted
2 Motor cars, heavy duty
8 Tie tamping outfits

Bessemer & Lake Erie
3 Adzing machines
1 Bolting machine
1 Boring machine, timber
1 Crane, rail
1 Drill, rail
1 Grinder, rail
6 Motor cars, section
1 Saw, rail
3 Tie tamping outfits
6 Trailers, track

Bevier & Southern
1 Motor car, section

Bingham & Garfield
1 Air compressor
2 Motor cars, heavy duty

Birmingham Southern
1 Grinder, rail
1 Motor car, inspection

Blue Ridge
1 Motor car, section
6 Motor cars, inspection

Bonhomie & Hattiesburg Southern
2 Motor cars, section

Boston & Maine
5 Automotive trucks
4 Bolt tighteners
4 Grinders, rail
4 Motor cars, section
1 Snow loader
1 Welding outfit

Cape Fear
1 Drill, electric

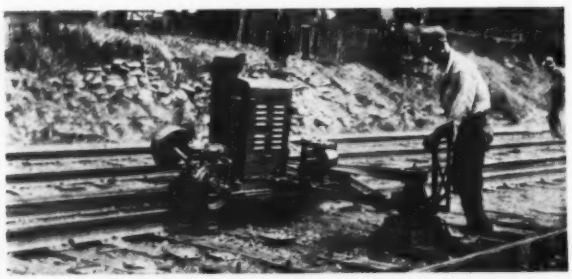
Carolina & Northwestern
1 Shovel, power

Central of Georgia
2 Adzing machines
1 Concrete mixer
3 Grinders, rail
9 Motor cars, inspection
2 Rail and flange lubricators
2 Wrenches, track

Chesapeake & Ohio
1 Adzing machine
3 Automotive trucks
2 Bolt tighteners
1 Boring machine, timber
1 Crane, rail
6 Drills, rail
1 Drill, bonding
1 Concretor
1 Electric generator set
2 Grinders, rail
1 Hoist—2½ ton
2 Magnets
1 Melting kettle
47 Motor cars, section
5 Motor cars, heavy duty
6 Motor cars, inspection
4 Paving breakers
2 Pneumatic pick hammers
15 Pumps, centrifugal
2 Pumps, grout
1 Rivet buster
2 Rivet hammers
1 Saw, timber
2 Tie tamping outfits
4 Tractors and incidental equipment
2 Trailers, track

Chicago & Eastern Illinois
1 Ballast cleaner
1 Concrete breaker
2 Cranes, rail
1 Hoist, air
1 Melting kettle
2 Motor cars, section
5 Motor cars, inspection
1 Pump, gasoline
1 Saw, power
2 Wrenches, track

Chicago & Illinois Midland
2 Tie tamping outfits



Tie Adzers Occupy an Important Place on the List

Chicago & North Western
4 Automotive trucks
3 Ballast discers
1 Ballast scarifier
1 Clay digger
3 Drills, rail
1 Drill, bonding
1 Drill, air
1 Drill, electric
2 Grinders, rail
103 Motor cars, section
17 Motor cars, heavy duty
20 Motor cars, inspection
11 Mowing machines
3 Saws, power
1 Wood working machine
1 Wrench, impact

Chicago & Western Indiana
1 Air compressor, crawler mounted
3 Cranes, locomotive
1 Drill, rail
1 Saw, power

Chicago, Burlington & Quincy
1 Bolting machine
2 Concrete mixers
2 Grinders, track
105 Motor cars, section
1 Motor car, inspection
2 Tie tamping outfits

Chicago Great Western
1 Adzing machine
1 Cribbing machine
1 Drill, rail
16 Motor cars, section
2 Motor cars, heavy duty
4 Motor cars, inspection
1 Wrench, track

Chicago, Indianapolis & Louisville
1 Crane, rail
1 Grinder, track
16 Motor cars, section
8 Motor cars, inspection
1 Tie tamping outfit

Chicago, Milwaukee, St. Paul & Pacific
1 Air compressor, crawler mounted
1 Bolt tightener
1 Clamshell bucket
52 Motor cars, section
23 Motor cars, inspection
20 Motor cars, heavy duty
3 Tie tamping outfits
4 Welding outfits

Chicago, Rock Island & Pacific
2 Discers
1 Dragline, crawler mounted
2 Extinguisher cars
100 Motor cars, section
48 Motor cars, inspection
6 Motor cars, heavy duty
6 Mowing machines
1 Tie tamping outfit

Chicago, St. Paul, Minneapolis & Omaha
2 Adzing machines
3 Bonding machine engines
2 Cranes, full revolving
2 Drills, rail
1 Jack, power
18 Motor cars, section
15 Motor cars, inspection
2 Mowing machines
2 Spike pullers
10 Track trailers

Cincinnati Union Terminal
2 Flange lubricators
1 Grinder, track

Cleveland, Cincinnati, Chicago & St. Louis
6 Adzing machines
3 Borers, tie
2 Cranes, rail
6 Grinders, rail
1 Paint spraying outfit
1 Saw, power

1 Shovel, power
1 Tow-boat, Diesel
1 Weed burner

Clinchfield
6 Motor cars, heavy duty

Colorado & Southern
1 Automobile truck
2 Borers, tie
1 Electric generator set
3 Motor cars, section
3 Motor cars, inspection
5 Motor cars, heavy duty
3 Saws, power

Cumberland & Pennsylvania
1 Weed burner

Deer Park
4 Automobile trucks
1 Tractor, crawler mounted

Delaware & Hudson
2 Boring machines, tie
1 Crane, rail
1 Drill, rail
3 Grinders, rail
1 Grinder, attachments for
4 Bolt hole treaters
3 Motor cars, inspection
4 Paint spray outfits
1 Pyrometer, optical
6 Rail inspectors
1 Shovel, power
8 Tie tamping outfits
5 Track machines

Denver & Rio Grande Western
3 Adzing machines
3 Bolt tighteners
4 Draglines, crawler mounted
1 Drill, rail
1 Grinder, rail
69 Motor cars, section
1 Motor car, inspection
3 Mowing machines
1 Tie tamping outfit

Denver & Salt Lake
1 Drill, rail
2 Motor cars, inspection
1 Paint spraying machine
2 Spike pullers, pneumatic
1 Tractor, crawler mounted
2 Wrenches, track

Detroit & Mackinac
1 Automobile truck
1 Motor car, inspection
2 Paint spraying machines

Detroit & Toledo Shore Line
1 Concrete vibrator
1 Grinder, rail
1 Grinder, electric

Detroit, Caro & Sandusky
1 Motor car, section

Detroit Terminal
1 Air compressor
1 Automobile truck

Detroit, Toledo & Ironton
3 Motor cars, section
2 Motor cars, heavy duty
5 Motor cars, inspection
2 Rail and flange lubricators

Duluth, Missabe & Iron Range
2 Automobile trucks
1 Ballast spreader
1 Discer
4 Motor cars, heavy duty
6 Motor cars, inspection
3 Rail and flange lubricators
1 Steel scow
1 Track machine, power

East Tennessee & Western North Carolina
1 Shovel, power, crawler mounted

Elgin, Joliet & Eastern
3 Automobile trucks
1 Air compressor
1 Crane, rail
1 Drill, air
1 Drill, bonding
1 Grinder, rail
3 Motor cars, section
7 Motor cars, heavy duty
3 Motor cars, inspection
1 Paint spraying outfit
1 Rail and flange lubricator
1 Sand blast outfit
1 Saw, power
2 Thawing outfits
1 Wrench, impact

Erie
1 Automobile passenger car
4 Automobile trucks
3 Bolt tighteners
3 Chippers, pneumatic
1 Drill, pneumatic
1 Drill, rail
1 Grinder, rail
1 Hammer, steam
1 Hoist, air
1 Milling machine
26 Motor cars, section
1 Motor car, inspection
1 Propulsion motor for air compressor
2 Rivet cutters
1 Rivet hammer
3 Take-off wheels and jacks
15 Tie tamping tools
3 Welding outfits

Escanaba & Lake Superior
1 Automobile, passenger

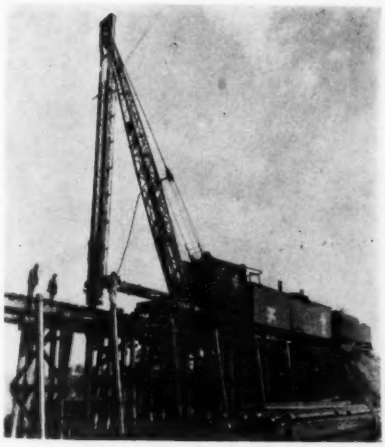
Essex Terminal
1 Motor car, inspection

Georgia
1 Motor car, section

Georgia & Florida
1 Tractor, crawler mounted

Great Northern
3 Adzing machines
1 Automobile, passenger
15 Automobiles, trucks
1 Automobile, covered trailer
5 Bolt tighteners
1 Discer
2 Grinders, rail
38 Motor cars, section
1 Motor car, heavy duty
16 Motor cars, bodies
2 Motor cars, engines
2 Paint spraying outfits
1 Paving breaker
2 Tie tamping outfits
1 Tractor
2 Weed mowers
1 Welding outfit

Gulf Coast Lines
1 Crane, rail
1 Dragline, crawler mounted
1 Motor car, section
9 Motor car, inspection
1 Pile driver, steam



More Pile Drivers Are Needed

Gulf, Mobile & Northern
1 Tie tamping outfit

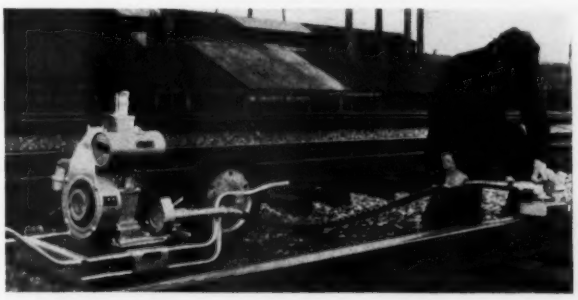
Huntingdon & Broad Top Mountain
1 Motor car, inspection
1 Shovel, power

Illinois Central
5 Adzing machines
3 Air compressors
1 Ballast discer
4 Bolt tighteners
1 Clamshell bucket
2 Cranes, rail
1 Dragline
7 Drills, rail
2 Electrolysis testing machines
1 Grinding machine, valve
2 Jacks, power
1 Lathe, portable
113 Motor cars, section
2 Motor cars, heavy duty
16 Mowing machines
1 Pump, centrifugal
1 Road grader
1 Sand blast machine
8 Spike drivers
3 Spike pullers
29 Tie tamping outfits
1 Tractor
1 Weed burner
1 Welding outfit
1 Wire scratch brush

Indianapolis Union
1 Motor car, section
1 Motor car, inspection

International-Great Northern
1 Crane, rail
2 Motor cars, section
4 Motor cars, inspection
1 Tie tamping outfit

Interstate
1 Drill, sinker
3 Motor cars, section



Grinders Were Almost Unheard of Ten Years Ago

The List Includes Rail Lubricators

Lake Superior & Ishpeming
1 Motor car, section

Lehigh & Hudson
1 Power track machine

Lehigh & New England
1 Automobile truck
2 Motor cars, section

Lehigh Valley
2 Bolt tighteners
1 Crane, crawler mounted
3 Drills
3 Grinders, rail
2 Paint spraying outfits
2 Rail and flange lubricators
3 Saws, power
3 Tractors and incidental equipment
2 Welding outfits

Louisville & Nashville
4 Bolt tighteners
10 Borers, timber
2 Cranes, rail
1 Crane, crawler mounted
2 Drills, rail
2 Jacks, 500-ton
1 Motor car, inspection
1 Pile hammer, steam
1 Saw, power
3 Tie tamping outfits
3 Timber sawing machines
2 Weed mowers
2 Wrenches, impact

Maine Central
4 Automobile trucks
2 Grinders
6 Motor cars, section
4 Motor cars, inspection
2 Motor cars, heavy duty
8 Tie tamping outfits
1 Tractor and incidental equipment
2 Track power machines

Manistee & Northeastern
4 Motor cars, section

Michigan Central
6 Bolt tighteners
2 Drills, rail
1 Grinding outfit
21 Motor cars, section
1 Power shovel
10 Tie tamping outfits
1 Welding outfit

Minneapolis & St. Louis
1 Air compressor
1 Crane, track
2 Motor cars, inspection
1 Mowing machine
2 Nut setters
1 Rivet buster
2 Saws, power
1 Tractor and incidental equipment
1 Wrench, impact

Minnesota & International
2 Motor cars, inspection

Missouri-Kansas-Texas
1 Automobile truck
1 Ballast cleaner
2 Bolt tighteners
2 Grinders, rail
2 Motor cars, section
2 Motor cars, inspection
2 Mowing machines
2 Weed burners

Missouri Pacific
1 Air compressor
1 Clamshell bucket
1 Concrete mixer
2 Concrete vibrators
1 Dragline, crawler mounted
2 Drills, bonding
1 Jack, 200-ton
17 Motor cars, section
8 Motor cars, heavy duty
21 Motor cars, inspection
2 Mowing machines
2 Paint spraying outfits
10 Tie tamping outfits
40 Trailers, track
1 Weed burner

Mobile & Ohio
2 Borers, timber
2 Compressors
1 Derrick, stiff-leg
2 Hole treaters
1 Paint spraying outfit
2 Pumps, centrifugal
2 Saws, power

New York Central
6 Bolt tighteners
1 Crane, locomotive
1 Crane, rail
1 Drill, rail
1 Dumping truck
5 Grinders, rail
7 Motor cars, section
2 Motor cars, heavy duty
1 Motor car, inspection
1 Saw, power
4 Tie adzers
6 Tie boring machines
20 Tie tamping outfits
2 Weed burners
4 Extinguishers
2 Welding outfits

New York, Chicago & St. Louis
1 Air compressor
1 Ballast scarifier
2 Concrete busters
1 Concrete mixer
6 Motor cars, inspection
2 Pumps, centrifugal gas
13 Rail and flange lubricators

New York, New Haven & Hartford
1 Air compressor
12 Automobiles, passenger
24 Automobiles, trucks
4 Bolt tighteners
2 Clamshell buckets
18 Drills, rail
13 Electric generators
1 Hammer, steam
10 Motor cars, inspection
1 Set pile leads
3 Pumps, centrifugal
15 Saws, power
25 Tie tamping outfits
1 Welding outfit

Norfolk & Western
2 Adzing machines
1 Air compressor
2 Concrete busters
3 Cranes, rail
1 Drill, heavy duty
3 Grinders, rail
2 Jacks, 150-ton
2 Lining transits
19 Motor cars, section
1 Motorized wheeled roller
11 Paint spray outfits
1 Shovel, power, crawler mounted
6 Spike drivers
16 Tie tamping outfits
1 Tractor
2 Welding outfits

Norfolk Southern
1 Ballast tamping outfit
1 Bolt tightener

Northwestern Pacific
1 Air compressor
1 Crane, rail
1 Paint spray outfit
1 Tractor, crawler mounted

Panama
3 Motor cars, section
1 Motor car, inspection

Pennsylvania
14 Automobile trucks
30 Bolt tighteners
3 Drills, bonding
2 Earth borers, truck mounted
9 Grinders, rail
1 Grinding car
31 Motor cars, section
2 Snow plows
2 Spike drivers
5 Tractor sweepers
1 Trailer, track
4 Welding outfits

Peoria & Eastern
1 Adzing machine
2 Bolt tighteners
1 Chemical weed spray car
1 Concrete mixer
1 Motor car, heavy duty
1 Motor car, inspection
1 Mowing machine

Peoria & Pekin Union
2 Bolt tighteners
1 Bulldozer
1 Drill, rail
1 Drill, bonding
1 Grinder, rail

Ballast Cleaners Are Still Used on Only a Few Railroads

1 Motor car, section
1 Mowing machine
1 Saw, power
1 Tie tamping outfit
1 Tractor

Pere Marquette
3 Adzing machines
2 Bolt tighteners
3 Motor cars, section
6 Motor cars, heavy duty
3 Motor cars, inspection
1 Mowing machine
7 Tie tamping outfits

Pittsburgh & Lake Erie
2 Adzing machines
1 Automobile truck
1 Borer, tie
1 Crane, rail
1 Cribbing machine
3 Grinders, rail
3 Motor cars, section
3 Motor cars, heavy duty
7 Motor cars, inspection
5 Power track machines
1 Rail puller and expander
2 Spike drivers
15 Tie tamping outfits

Pittsburgh & West Virginia
1 Concrete mixer
3 Motor cars, section
1 Pump, centrifugal
8 Tie tamping outfits
1 Tractor and incidental equipment
1 Welding outfit

Pittsburgh, Chartiers & Youghiogheny
1 Automobile truck

Port Townsend Southern
1 Motor car, heavy duty
1 Motor car, inspection

Reading
1 Air compressor
2 Automobile trucks
3 Grinders, rail
1 Paint spray machine
20 Tie tamping outfits

Richmond, Fredericksburg & Potomac
1 Drill, bonding
7 Motor cars, section
1 Welding outfit

St. Joseph Belt
1 Grinder, rail

St. Louis-San Francisco
1 Air compressor
2 Bolt tighteners
1 Drill, rail
1 Jackhamer
15 Motor cars, section
10 Motor cars, inspection
1 Mowing machine
2 Spike drivers
1 Spike puller

St. Louis Southwestern
3 Adzing machines
2 Air compressors, crawler mounted
1 Ballast discer
1 Ballast scarifier
2 Bolt tighteners
2 Draglines, crawler mounted
4 Motor cars, heavy duty
4 Motor cars, inspection
1 Mowing machine
8 Tie tamping outfits

San Diego & Arizona Eastern
1 Adzing machine

Seaboard Air Line
2 Grinding machines
6 Motor cars
2 Paint spray outfits

Southern
3 Adzing machines
1 Air compressor
8 Bolt tighteners
1 Sand blast outfit
1 Shovel, power, crawler-mounted

Southern Pacific
9 Air compressors
13 Automobile trucks
2 Bolt tighteners
10 Borers, timber
2 Concrete distributing equipment
12 Drills, pneumatic
2 Gasoline engines
2 Hoists, air
18 Motor cars, section
11 Motor cars, heavy duty
26 Motor cars, inspection
4 Paint spray machines
2 Paving breakers
3 Pumps, centrifugal
6 Rivet hammers
3 Saws, power
10 Spike drivers
2 Tie tamping outfits
16 Tie tamping tools
3 Tractors and incidental equipment
8 Wrenches, pneumatic

Southern Pacific
(Lines in Texas & Louisiana)
1 Air compressor
1 Borer, timber
1 Dragline
1 Hammer, steam
15 Motor cars, section
7 Motor cars, heavy duty
28 Motor cars, inspection
8 Tie tamping outfits
16 Tie tamping tools
1 Tractor
1 Welding outfit

Spokane, Portland & Seattle
1 Air compressor
4 Jacks
8 Motor cars, section

Sumpter Valley
1 Shovel, power

Texas & Pacific
4 Adzing machines
1 Ballast cleaner
1 Ballast discer
2 Bolt tighteners
1 Crane, rail
16 Motor cars, section
2 Motor cars, inspection
6 Tie tampers

Texas City Terminal
1 Crane, locomotive

Toledo, Peoria & Western
2 Cranes, rail
2 Jacks, 75 tons
5 Motor cars, inspection
1 Saw, power

Trona
1 Motor car, heavy duty

Tucson, Cornelia & Gila Bend
2 Motor cars, section

Union Pacific
2 Air compressors
5 Ballast discers
3 Bolt tighteners
1 Bond welding outfit
2 Borers, timber
2 Draglines, crawler mounted
1 Drill, rail
1 Grinder
3 Motor cars, inspection
2 Motor cars, battery distributing
3 Pumps, centrifugal
1 Shovel, power
1 Snow loader
1 Spike puller
2 Tractors

Tampers Are Used More Widely

Union Railroad
2 Drills, rail
1 Motor car, heavy duty
2 Paint scrapers
1 Pump, centrifugal
6 Rotary cleaners
8 Tie tamping outfits
1 Welding outfit

Verde Tunnel & Smelter
1 Motor car, section

Virginian
12 Rail and flange lubricators

Wabash
2 Bolt tighteners
1 Crane, rail
1 Drill, corner
7 Motor cars, section
5 Spike drivers
1 Spike puller
30 Tie tamping outfits
6 Trailers, track

Washington, Idaho & Montana
2 Motor cars, section

Western of Alabama
1 Flange lubricator
3 Motor cars, section

Western Maryland
13 Motor cars, section
1 Mowing machine
2 Shovels, power
1 Sweeper, power
4 Tie tamping outfits
1 Weed burner

Western Pacific
2 Bolt tighteners
1 Drill, rail
11 Rail and flange lubricators

Yadkin
2 Motor cars, section

National of Mexico
1 Shovel, power

Pacific Great Eastern
1 Air compressor
2 Motor cars, inspection
1 Weed spraying outfit

Toronto, Hamilton & Buffalo
8 Tie tamping outfits

Southern Pacific of Mexico
1 Bulldozer
8 Motor cars, inspection
1 Tractor

Why I Attend a Convention?

Nineteen maintenance officers relate their experiences at recent meetings of the Roadmasters and of the Bridge and Building associations

ENGINEERING and maintenance of way officers of the railways are served by three associations. One of these, the American Railway Engineering Association, with its companion exhibit of the National Railway Appliances Association, will meet in Chicago on March 15-17. The other two, the Roadmasters and Maintenance of Way Association and the American Railway Bridge and Building Association, also with exhibits of materials and equipment of interest to these groups, meet in Chicago on September 14-16 and October 19-21, respectively. More than 450 railway officers attended these latter two meetings and 1,000 will attend the convention of the Engineering association.

And railway officers have been attending these conventions year after year for 39 years (A.R.E.A.), 44 years (Bridge and Building) and 52 years (Roadmasters). Why do they do so? Has the effort been worth while? What benefits have they realized individually and for their railways? These questions confront railway men as the conventions arrive year after year. They also confront railway managements when they face the decision regarding authorizing the attendance of their officers.

To develop the answers to these questions most directly and authoritatively, we addressed some 25 men selected at random from those who attended the recent conventions of the Roadmasters and the Bridge and Building associations. Their replies are presented in following columns.

From the Roadmasters Convention

From the Burlington

I had three purposes in attending the convention. I wished again to meet and talk with men doing the same work I am trying to do, men whom I have come to think of as close friends through many years of association and many of whom, scattered as they are, there is no other opportunity to meet. Otherwise, in a few cases I wanted to discuss further with some of these men matters we had touched on previously and to ascertain how certain methods of handling work or materials were working out after further experience. I preferred to talk with them about these matters rather than to handle by correspondence, as I have found that it is possible to get much more definite and satisfactory information in a few minutes personal conversation than can be developed even by extended correspondence.

The second reason was that I wanted to see the exhibit of tools, materials, and equipment used in track maintenance, conveniently assembled and arranged for my inspection and in charge of men who could answer questions that might arise in connection with the use and application of these tools and materials.

A third, and perhaps the most important reason, I desired to hear the committee reports that had been prepared by competent and qualified railroad maintenance men, representing many roads and so located geographically that they were personally familiar with the varied conditions. Of course, it would be possible to read the reports when published, but I have often found that the discussion following the presentation of the report is at least as valuable as the report itself.

The convention sessions are not cut-and-dried affairs. Anyone is free to speak. Fortunately, there are still many rugged individualists among railroad maintenance men who do their own thinking and have their own ideas and it is always stimulating and helpful to listen to these men explain and defend their positions. These speakers are usually men in very close touch with the job itself and speak with the authority of practical experience.

These are the principal reasons why I attended not only the last convention, but every convention for the last 15 or 16 years. I have always found this effort well repaid.—H. R. Clarke, engineer maintenance of way, Chicago.

From the Southern Pacific

I attended the recent Roadmasters' convention to renew old acquaintances, to make personal contact with track maintenance officers from other railroads and from different sections of the country in order that I might discuss my problems and exchange ideas with them, and to hear and take part in the discussion of the various reports presented by the committees, for the purpose of checking up on

myself and broadening my knowledge. The subjects presented were timely.

The addresses alone repaid anyone for attending the convention. I was especially impressed and benefited by the address of H. R. Duncan, on The Roadmaster's Responsibility for Tie Life, and by that of H. S. Clarke, on Building Track for Today's Traffic.

The track supply exhibit was interesting and worth while. It afforded me opportunity to compare the various products and also to exchange ideas with the exhibitors and sales representatives.

I took advantage of my trip to travel to and from Chicago over a number of well maintained railroads for the purpose of making track and operating observations which proved both interesting and beneficial.—A. W. Wehner, roadmaster, Lake Charles, La.

From the Southern

I have been a member of the Roadmasters Association for approximately twenty years. During this period I did a limited amount of committee work and was always interested in reading the proceedings of the conventions. I never attended a Roadmasters' convention until 1936 but prior to that time I really thought that I was obtaining a great deal of benefit from my membership in this association. Now, however, I can truthfully say that the difference between reading the reports of the proceedings and actual attendance at the conventions is almost as great as that between night and day. If I miss another Roadmasters' convention it will be due to causes beyond my control.

I was chairman of a committee in the Roadmasters Association last year and derived great benefit from this work. I was particularly impressed with the splendid co-operation of various members of the committee. I am encouraging all of my men who belong to the Roadmasters Association to volunteer for committee work, for I believe that it is necessary for one to put something into an association like this if he expects to derive much benefit from it.

To me the most interesting discussions at the last convention were those centering around the subject of continuously welded rail. The information I obtained on this subject alone was more than sufficient to justify my trip to that particular convention.

There is much to be learned by attending a Roadmasters' convention in addition to the subjects discussed at the convention itself. The opportunity is offered to meet and talk on many different subjects with men from other railroads and in this way obtain new ideas. For instance, during the last convention I talked with a roadmaster on the Missouri Pacific who described a very simple method he had been using for relieving tight rail in dips. I had never thought or heard of this method but from his description I know that it will work, and I expect to put it to use next summer.

I cannot speak too highly of the men who attend the Roadmasters' conventions. They are a group of very earnest workers, deeply interested in every phase of maintenance, seeking more information concerning their work and willing to impart to others any information they have which may be helpful. I am proud to be associated with such a fine body of earnest men and I feel sorry for any maintenance man who overlooks such an opportunity to improve his store of knowledge.—G. L. Sitton, chief engineer maintenance of way and structures, Eastern Lines, Charlotte, N.C.

From the Nickel Plate

Considering the many changes and improvements in materials and tools, as well as in methods and practices from year to year, I have found that participation in committee work and attendance at the annual convention is well worth while in order that I may keep up with the progress in maintenance work.

The information that I get from the discussions at this meeting help me to form a better opinion about the methods and tools that I am considering using or recommending for use by our company.—J. H. Dunn, roadmaster, Ft. Wayne, Ind.

From the Big Four

It has been my privilege to attend every annual convention of the Roadmasters Association since 1912. Then a young track supervisor, I quickly realized the benefits to be gained, not only from attendance but also by active participation in the discussion and preparation of reports. Later I was able to assist in handling the affairs of the association.

In attending the 1937 annual convention, I was benefited by hearing the reports, together with the discussion that they brought forth. Being present at the meeting is far more valuable than reading the reports elsewhere.

It was also of direct advantage to me to be able to study the display of equipment and supplies. In this period of reduced man power and increasing use of power equipment, I was anxious to see the latest developments in certain lines of machinery. The exhibit presented an opportunity to satisfy this desire. —L. M. Denney, supervisor, Indianapolis, Ind.

From the Chesapeake & Ohio

I have been attending the Roadmasters' conventions since 1907 and what I have seen and learned each year has been of much benefit to me in solving the many difficult problems that confront us almost every day. My first thought in attending the Roadmasters' convention each year is to meet the officers and committeemen who prepare and present the reports and give them what help I can in making the meeting a success. I attend also to represent my railroad because it is the railroads which gain through our attendance.

I also think of the many men that have built our association up to what it is today and are still willing to put their shoulders to the wheel and contribute liberally of their practical knowledge. We should be proud of these men.

These men are of that group which comprises the real foundation of the railways. In their earlier years, they did not have the aids we now enjoy and when there was work to be done, they did it with sheer effort. These men represent the roots of the great railways, reaching out far into the soil for holding power sufficient to carry the great burden that rests upon their shoulders. The many other departments of the railroad may be likened to limbs of this tree, and many times when the strong wind (shortage of funds) comes along, the weight bears heavily upon this foundation and its strong roots stand it in good stead in helping it to resist the pressure.

The benefits that I derived each year from attending these conventions and mingling with these men means more to me than money could buy. The reports and papers deal with problems that confront me and the papers are prepared in the manner that is most helpful to me. Our railroads can spend their money in no better way than in sending their roadmasters and supervisors to the Roadmasters' conventions.

All who are sent to the Roadmasters' convention each year must have their railroad at heart and get all

from the reports that is given because they must make reports to their superior officers when back as to what they learned and saw.

I like to attend the Roadmasters' meetings also because I see and learn much about the new machinery which will be of so much help to us in handling our heavier track materials. Such machinery as we have already received has helped to make our work safer and lighter. I have found men at these conventions who are ready to instruct us in the ways of using this new machinery.

May I add this further word to the younger maintenance officers who are following us that they should participate in the activities of this association because it is from the roadmasters and supervisors who attend that they can secure the help that they will need many times if they are to be able to carry on most advantageously.—W. H. Sparks, general inspector of track, Russell, Ky.

From the Chicago & Eastern Illinois

I attended the convention of the Roadmasters Association last September as I have attended almost all of them since Supervisor James Sweeney signed my application in 1908. Why shouldn't I attend these conventions? I have been more than repaid for all the time I have spent there and have never regretted the money spent in dues.

My purpose in attending this meeting as well as previous conventions was to pick up the new ideas and opinions that were so clearly brought out in the various committee reports and the discussions thereon. I hope that I will never become too old to learn new and better methods.

The recent convention was the best since the depression. The reports and discussions were so timely and so clearly presented that no trackman could fail to profit by hearing them read and discussed. I was pleased that the October issue of *Railway Engineering and Maintenance* carried the entire proceedings of this convention and I made it a point to see that both of my copies of this number were started over my district immediately so that every one of my section foremen and his men could read them. This aided in educating my men in regard to safer highway crossings, better ways to cure soft spots in roadbed, better ways to lay rail, their responsibility for increased life of crossties and in ways to operate motor cars to avoid accidents. All of these topics are of concern to our railroad and for this reason we were instructed to attend this convention. —Lawrence Coffel, track supervisor, Momence, Ill.

From the Southern

I attended the Roadmasters' convention for the purpose of better acquainting myself with the latest developments in track maintenance through the committee reports and discussions, and through contact with other maintenance officers. One of my aims was to meet maintenance men from all parts of the country and learn their methods of handling the everyday problems of track maintenance.

The reports presented were instructive. The committee chairmen were well informed. Their reports showed careful study of the problems with which they dealt. It was in the discussions of these reports that I found that for which I had been looking, the ideas of men from all parts of the country. The convention offered the only possible place where I could secure this information first hand.

The Track Supply Association's exhibit afforded me an opportunity to see and study equipment and materials other than those used by the company with which I am employed. This was a very valuable part of the convention.

In all, I feel that I have been repaid several times over by attending the convention and hope to have the privilege of being present next year. —J. F. Beaver, track supervisor, Greenville, S.C.

From the Florida East Coast

The convention of the Roadmasters Association in Chicago last September was the first I have attended for a number of years, and I found that it was a very worthwhile meeting. The reports of the committees showed that they had been prepared with painstaking effort, and the subsequent discussions on the floor were equally interesting and instructive. What impressed me most was the number of members taking part in these discussions, for these discussions brought out many points concerning the subjects that would otherwise have been missed.—J. H. Morgan, engineer maintenance of way, St. Augustine, Fla.

From the Western Maryland

The thorough and businesslike handling of the affairs of the association, the caliber of the men responsible for its activities, the authoritative addresses on timely, modern maintenance subjects, the practical and educational value of the well-prepared reports presented by the committees, representing a thorough study on subjects assigned, and the open active discussion which followed, have made the Roadmasters' convention an occasion to which most maintenance men not only look forward, but one from which they can bring back to their roads, modern methods and constructive ideas, which most certainly will be reflected in their work.—J. M. Miller, division engineer, Cumberland, Md.

From the Bridge and Building Convention

From the New Haven

While the impelling reason for my attendance at the last meeting of the Bridge and Building Association was the fact that I had agreed to present a paper, and that the convention was the twentieth anniversary of the convention over which I presided as president, there was a still deeper underlying reason why I accepted the invitation to present a paper and attend the convention, and that was my purpose to encourage attendance at such conventions for the free exchange of experiences. The knowledge that any one of us gains through his own experiences in life is small; we still would be living in the dark ages if each of us had to depend entirely on knowledge gained from his own experiences. Through the medium of books and other records, lectures, pictures, etc., we learn from the experiences of others, and gain knowledge many times as fast as it could be gained from personal experiences alone.

Today, men engaged in similar enterprises throughout the country and, indeed, throughout the world, are having many new experiences. New

methods are continually being discovered and tried. Their results are known to those who try them. Others may have only a casual knowledge or no knowledge whatever of these new methods or of the effects of older methods which they have had no cause to follow. Technical papers, notably *Railway Engineering and Maintenance,* are doing a fine job in disseminating information that brings to all such men the results of the experiences of others in the same branch of railway work in which they are engaged.

Meeting in convention, men have an opportunity to relate their latest experiences, and to make available to their co-workers the best and latest of their experiences, from which others may select those practices that will be helpful and cost-saving, and learn to avoid other practices that may be quite costly. Such meetings also enable those in attendance frequently to learn how to overcome difficulties through the experiences of others, correction of which has not been indicated by their own experiences.

I sat through several sessions of the convention, where I listened intently and learned a great deal. I am sure that others learned enough to make their attendance worth while, and to feel as I did, fully repaid for being there.—C. E. Smith, vice-president, New Haven, Conn.

From the Pennsylvania

I have attended the bridge and building conventions for several years for the purpose of increasing my knoweldge of railroad construction and maintenance, not only theoretically but also by contact with men who are engaged daily in this important phase of railroad work. The exchange of ideas on the convention floor brings out methods and practices which cannot be embodied in reports, and that are therefore missed by those who are unable to attend the sessions.

Opportunity for association with men from other railroads who are supervising work similar to my own, develops valuable information, which amply repays me for my attendance at these meetings. The information gained from the exhibits and from contact with supply men has helped me to keep in touch with the latest developments in labor-saving equipment, and has, in several instances, resulted in savings to my company which have been effected through the employment of more economical methods in construction and maintenance work.

The American Railway Bridge and Building Association is doing a big job in the education, not only of its own members, but of all bridge and building men who come in contact with the reports of this association as published in *Railway Engineering and Maintenance.*—W. R. Ganser, master carpenter, Camden, N.J.

From the Bangor & Aroostook

Three reports stood out in the last Bridge and Building convention,—those on the Development of Timber Trestle Construction, on the Use of Power Tools and on Fire Protection. These three reports with the discussions that followed alone repaid me for going to the convention. We were also fortunate to hear the addresses by C. E. Smith on Purchasing Bridge and Building Materials, and by S. H. Osborne, on Safety in Bridge and Building work, which talks were to the point and struck home.—W. J. Strout, bridge and building superintendent, Houlton, Maine.

From the Illinois Central

I attended the last convention of the Bridge and Building association, as I always do when time is available, particularly to hear the discussion of reports on the floor in which information is always brought out which can be obtained in no other way. I also desired to see and learn of new tools and appliances and of improvements in old ones, as displayed in the exhibits. I have in mind an exhibit demonstrating the use of different metals and alloys of metals in the construction of valves which was highly instructive.

I also had an opportunity to meet a number of the members and renew acquaintance of long standing. I found in evidence the same earnestness and close attention to the proceedings on the part of the members that have characterized all the conventions of the Bridge and Building association that I have attended during the last twenty years.—Maro Johnson, principal assistant engineer, Chicago.

From the Big Four

It is difficult to measure the benefits that one derives from attendance at the Bridge and Building convention, for there is no other place where one may gather as much information regarding the experience of men from all over the country. No individual and no railroad has all of the good ideas. There is someone on some railroad that has a good idea that is worth acquiring; the discussions at the conventions bring these ideas to light. This is no time for a man to feel that he can stop learning; conditions in the railroad field are changing too rapidly for that.

An efficient railway man must know the modern methods of doing work and modern trends in design. I have found that the Bridge and Building conventions provide opportunity to learn these ideas. If more railway executives knew of the benefits to be derived by those who attend these meetings, they would insist on their supervisors belonging to this association and attending the annual conventions regularly.—C. R. Taggart, bridge and building foreman, Indianapolis, Ind.

From the Missouri Pacific

I found that the reports and the discussions at the last convention were of direct assistance to me in solving some of the problems which confront me in handling various projects connected with our work. The reports pointed out new ways to get things done in the most safe and economical manner. If there ever was a time when railroad officers should study ways of reducing expenses, it is now. If more bridge and building officers could find it convenient to attend these conventions, this action would contribute to the economy with which our railroads are maintained.

I found the exhibit especially interesting. The improvements in tools, equipment and materials, as well as the interest shown by the representatives in displaying them, were very helpful to me and the information that I secured there will be of great value to me when I come into the market for these products.—L. G. Byrd, bridge and building supervisor, Poplar Bluff, Mo.

From the Lackawanna

I attended the Bridge and Building convention to acquire first-hand information regarding the practical methods pursued today by various railroads in the maintenance of their structures. I was fully repaid for the effort made in attending this convention. I heard some excellent papers and discussions from which I was able to obtain new ideas and methods which are of benefit to me in the performance of our maintenance work. In the exhibit I was also able to secure detailed information regarding various tools and supplies,

which are available for use in maintenance work.

I was struck with the exceptionally friendly feeling that existed and the willingness of the members to express their ideas on the problems that confront them. I came away with the conviction that it would be advisable for supervisory officers of the building and bridge department, and especially for the head of these departments, to attend these conventions regularly for they will procure information there that will be valuable to them in the performance of their duties on their railroads.—John L. Vogel, bridge engineer, Hoboken, N.J.

From the Louisville & Nashville

I was greatly interested in the discussions of the various committee reports presented at the convention, all of which were live and of vital importance to bridge and building men. These reports covered their subjects thoroughly and while some of us did not agree with certain parts, the discussion brought out some very helpful details. I was especially interested in the reports on Fire Protection, on Safety in the Use of Power Tools and on the Water Service Demands of Today.

I have found that the subjects assigned to committees for report at these meetings are up-to-date and practical. These meetings bring out the different methods of handling problems on various roads, and give one person the other fellow's viewpoint and, best of all, his actual experiences. The manufacturers exhibits provide opportunity for personal touch with the latest and most improved materials, tools and equipment.

I have also found the personal contact with members of this association very helpful in fostering a friendly attitude between our railroads and bringing our mutual interests closer together.—M. P. Walden, assistant supervisor, bridges and buildings, Evansville, Ind.

From the Pere Marquette

Why did I attend the Bridge and Building Convention? To answer this question, I need only go back in retrospect to the conventions I have attended in previous years. I came to improve myself in order that I might become more efficient and proficient in my work.

Was it worth while? No one can sit through the sessions, if he pays attention to the reports and discussions, without absorbing many points that will be of real value to him in his work.

What did I learn? That the railroad world is moving forward at a faster pace than many realize. It is the things we learn at these conventions that enable us to stay in the procession.

Was I repaid? Amply so. The report on water service alone was worth the time and effort, if there had been none other.

Will my employers be amply repaid? I firmly believe they will. Taking into consideration the knowledge gained from the splendid reports, and the discussions which followed, as well as the many good ideas gleaned through conversation with members between sessions, I cannot understand how any man could return to his railway without being enabled to put into effect economies that would amply repay the management for the time and expense incurred.

Another feature that should not be overlooked was the exhibit of materials. In making a study of it, I found many improvements on old tools, and some new tools and machines, to facilitate our work. This in itself was an education.—J. P. Wood, supervisor bridges, buildings and water service, Grand Ledge, Mich.

Steel Tank Moved 12.3 Miles in 2 Hours

Ingenious plan developed by master carpenter on Rock Island involved use of gondola car loaded with sand and novel method of bracing

A 50,000 gal. conical-bottom steel water tank was moved intact a distance of more than 12 miles by a work train on the Chicago, Rock Island & Pacific in two hours' time. Because of initiative and resourcefulness in developing this bold plan and painstaking care to insure that it would be carried out successfully, the transfer of the tank was made at a fraction of the cost that would have been involved in taking down the tank at the original location and in reerecting it in its new position. Moreover, the limited time in which the transfer was made obviated any outlay for temporary facilities for water supply while the tank was out of service.

The Tank Was Rigidly Braced

Superficial examination of the illustrations might possibly convey the impression of limited stability of the load. However, as described below, the loading of the tank was handled in such a way as to give the load a much lower center of gravity than is apparent in the pictures.

Why the Tank Was Moved

This tank comprised an element of the water service facilities at Kanorado, Kan., which had proved unsatisfactory for several reasons. Foremost among these was the fact that the water supply obtained from a well was failing, but, in addition, the location was not entirely satisfactory from an operating standpoint. Consequently after an ample municipal water supply was developed at Burlington, Colo., which is located 12.3 miles farther west, and is a much more favorable location for a water station so far as train operation is concerned, arrangements were made to purchase city water at that point

On the Way—Lower Part of Riser Loaded on Flat Car

and close the station at Kanorado. This plan had an advantage also in that the facilities at Burlington require no attendance. In view of this arrangement it was desirable to move the tank from Kanorado to Burlington.

Almost every conceivable plan for the moving of the tank was considered. Estimates were made of the cost of taking the tank down and re-erecting it, and it was also suggested that the tank be laid on its side on a flat car by means of a wrecker. But all of the plans were discarded in favor of the one finally adopted. As the track is on tangent for the entire distance, the project did not impose the question of the stability of the load on curve superelevation, and roadway obstructions were confined to sign posts, etc., that could be removed and replaced at small expense.

Was Moved Intact

The tank was moved intact, except for the removal of the lower half of the riser pipe, which is shown loaded on a flat car in one of the illustrations. This was done so that a temporary track could be built between the tower legs, and so that the gondola car on which the tank was loaded would clear the remaining portion of the riser. After the car was spotted in position, the tank, which had previously been jacked up, was lowered to rest on stringers, and braced rigidly to the car body by means of timbers and cables in which the slack was taken up with pulling jacks.

Obviously, the most critical feature of the project was the high center of gravity of the tank, but this difficulty was met effectively in an ingenious manner, namely, by loading the car with sand. Owing to the fastening of the tank to the car body, the center of gravity of the load, so far as the car springs or the support on the rails was concerned, was the center of gravity of the total load, but because the weight of the sand, with its low center of gravity, was several times the weight of the tank, the combined center of gravity was low enough to insure an ample margin of safety with respect to stability.

Delivered to Exact Position

At the new location of the tank, a nearby passing track was cut and thrown temporarily to a position between the new concrete pedestals, so that the car could be stopped with the tower legs of the tank centered over them. The tank was enroute from its old to its new position for an elapsed time of about two hours and the average speed on the main track was approximately 10 miles per hour. The movement was carried out strictly in accordance with the plan and no trouble was encountered in any stage of the operation.

An Unstable Appearing Load, but Sand Placed in the Car Lowered the Center of Gravity of the Combined Load

In addition to three hours of work-train service, the project involved six days' time of a bridge gang composed of four carpenters and four laborers, one day's time of a section gang in removing and replacing roadway signs, and the service of two track gangs in constructing the temporary tracks and removing them. The labor required was as follows:

Bridge Gang	Man-hours
Raising, bracing and loading tank	268
Moving tank	71
Unloading and setting tank	144
Working on track for handling tank	144
Track labor	
Removing and replacing sign posts, etc.	32
Constructing and shifting tracks at Kanorado and Burlington	600

The method of moving the tank was planned and carried out under the direction of P. E. Strate, master carpenter, Fairbury, Neb., assisted by Clyde Humphrey, carpenter foreman. The project was handled under the general supervision of F. E. Manson, division engineer.

Train Derailed By Loaded Push Car

THE death of an engineman and the injury of a fireman and a head brakeman in the derailment of a freight train on the Cleveland, Cincinnati, Chicago & St. Louis at Cobb, Ill., on October 6, were the result of a failure of a bridge gang to get into the clear with a motor car and a push car loaded with lumber. The bridge gang started from Carbon, 6.2 miles east of Cobb at 7 a.m. on the westward track after obtaining a lineup from the dispatcher from which the foreman concluded that he had ample time to reach Cobb ahead of several freight trains approaching from the east, the nearest of which were at Greencastle, 13.8 miles east of Carbon.

Upon approaching Cobb a westbound train was observed about ¾ of a mile away, but instead of stopping at once to flag the train and remove the cars, they were operated some distance farther, as the foreman hoped to get in the clear on a siding. When this was found impossible, the cars were stopped and the men were attempting to unload the trailer when the train struck it at 7:25.

According to the report of the Bureau of Safety of the Interstate Commerce Commission there was considerable confusion as to the exact nature of the lineup, but the conclusion reached by the Bureau is confined to the statement that "this accident was caused by the operation of section motor car on the main track too close to the time of a following train, and failure of the crew of the motor car to provide adequate flag protection." It was suggested that if a fusee had been dropped or some other signal had been given when the train was first seen, the accident might have been averted, or would not have been so disastrous.

What Causes Soft Spots in the Roadbed?*

LACK of proper drainage sums up all that can be said about the causes of soft spots in the roadbed, although the details of how they occur are so varied that a full discussion would fill a volume. In general, a description of the several types of soft spots as they are encountered will give a reasonably clear indication of the causes of their occurrence. Since the conditions under which they develop and the measures necessary to eliminate them differ between cuts and fills, these subjects will be considered separately but briefly for each of these classes of roadbed.

Four general types of soft spots are found in cuts:

(a) This type includes those soft spots which result from water pockets in the floor of rock cuts in which the subgrade was not crowned for drainage during construction.

(b) This type is sometimes referred to as winter springs. It occurs in rock cuts in which the water table is well above the elevation of the subgrade and the rock strata are separated by strata of water-bearing material, thus allowing free water to seep into the roadbed from outside the cut.

(c) Pumping red shale cuts. Red shale possesses capillarity to a high degree, for which reason water works its way against gravity from a greater depth, more rapidly and in greater volume through red shale than through almost any other roadbed material. The effect is easily recognized by the characteristic red-paint-like appearance of the semifluid substance that works its way up through the inter-stices of the ballast, spraying the adjacent ties, ballast and rail under passing wheel loads.

(d) This type occurs in clay subgrades when the ballast is driven into the roadbed, forming a water pocket, pushing out the shoulder and, in some instances, forming a wall of impermeable material which prevents the water in the pocket from escaping by natural means. This is known by trackmen in many localities as a push-out.

Obviously, since water is basically the cause of the soft spots of all of the four types mentioned, correction consists principally in getting rid of it. Experience has shown that the same general method of correction, with such modifications as are necessary to meet local conditions, can be employed for all cases. This consists of installing lateral drains to release or draw off the trapped or seeping water. A longitudinal sub-surface drain, or drains, of ample size and depth, usually located below the surface ditch or ditches of the cut, is provided to serve as an outfall for the lateral drainage and to cut off any water that may be reaching the roadbed from outside the cut.

Lateral drains may be either perforated pipe or French drains. If the former, the trench should be backfilled with porous material to assure quick passage of seepage water into the drain. If it is a French drain the trench should be backfilled with large stone, which should be topped with stone of ballast size to give the effect of a filter and thus avoid early fouling of the drain. Planks laid on the bottom of a French drain will prevent the large stone from penetrating the subsoil and thus cause irregularities which will retard the effective drainage of the trench.

Lateral drains should extend not less than 12 in. below the bottom of the water pocket; 24 in. is preferable. The longitudinal outfall drain may be either perforated pipe or open-joint vitrified sewer pipe. In either event, however, the backfilling should be of permeable material graduated like that suggested for the lateral drains.

Modification of the corrective measures, which have been merely outlined, may become necessary. Thus, if there is a water pocket in the rock floor of a cut, it will be necessary to channel through rock from the lowest point of the pocket to the side ditch of the cut, which obviously must be of sufficient depth to dispose of the water.

If the rock cut passes through a formation containing water-bearing strata, a surface ditch or system of ditches should be constructed, not only to intercept all surface water before it reaches the cut, but to carry it away quickly before it has an opportunity to percolate into the water-bearing stratum or strata. Red shale and clay soils need the same precautionary treatment. In extreme cases it may become necessary to excavate both red shale and clay roadbed to a considerable depth and replace them with stable material of less capillarity.

In general, the manifestations of water pockets in embankments differ little from those in cuts, and the basic cure is the same, that is, adequate drainage. Yet, when they are traced to the source, an entirely different set of causative conditions are encountered. These are:

(a) When clay and other impervious materials are intermixed with pervious materials during the construction of the embankment, the former tend to prevent the escape of the water which falls upon the roadbed in the form of rain or snow and percolates into it. Being held as in a pocket, the water softens the surrounding material to form a soft spot and eventually pumps up through the pervious material and ballast.

(b) Ballast settles into the subgrade, forming a reservoir to hold a small amount of water which reacts on the surrounding material to soften it, after which the situation becomes similar to (a).

In both of these cases the water pockets enlarge, thus increasing their capacity to hold water. This action will continue, usually slowly but at other times with surprising rapidity, until the situation, entirely out of hand, has reached the point where corrective rather than preventive measures are demanded.

In applying corrective measures, both types of water pockets should be treated in the same way. An effective method for smaller pockets is to construct a sump in the inter-track space on a multiple track line and back fill it like a French drain. A pipe to drain this sump should be laid through one side of the embankment on a gradient of not less than five per cent. If the pocket is large, French drains should be constructed at such intervals as the conditions demand, extending entirely through the embankment, with the floor of the drain on a slope that will insure rapid disposal of the water. As an alternative, either perforated or open-joint pipe can be used.

In all types of soft spots the removal of unstable material and replacement with heavy or rough material will be effective for only a short time. In fact, usually, this form of treatment, when used alone, aggravates the condition eventually and makes it worse instead of better. To obtain satisfactory and lasting results it is necessary to remove the water entrapped in the pocket as thor-

*This discussion was submitted for publication in the What's the Answer department in the March issue by a railway officer who preferred to remain anonymous. Owing to its scope it was withheld for presentation here as an independent article. For further discussion of this subject see page 215 of the March, 1937, issue.

oughly and quickly as practicable. In many cases it is also necessary to lower the water table in the surrounding soil. With few exceptions the so-called unstable soils possess excellent bearing qualities when they are dried out. Advantage can, therefore, be taken of this characteristic to improve conditions materially by providing adequate drainage, suited to the particular situation which must be met. No investment in maintenance will give a larger return than money spent on drainage where it is needed.

Getting at the Root of the Safety Problem*

By M. M. Killen

General Foreman Bridges and Buildings, Gulf, Colorado and Santa Fe, Galveston, Tex.

THE ONLY way to get satisfactory results in injury prevention among maintenance of way employees is first thoroughly to convert supervisory officers to the need for securing safe workmanship. All supervisors must be in sympathy with the safety movement and be safety-conscious to such an extent that they can recognize the symptoms of injuries and prevent them before they actually occur. When this has been accomplished, the remaining tasks are simplified.

If, however, supervisors do not have the desired attitude toward the safety movement, it is more than probable that the final result will not be satisfactory. Granted that supervisors are safety minded, the actual work of securing results may be divided into three general classifications: (1) Selection, (2) salesmanship, and (3) supervision.

Selection

The selection of men, as a phase of safety work has received far less attention in the maintenance of way department than its importance warrants. In employing new men, we have been prone to look only upon the physical qualifications of applicants rather than to consider each man as a potential supervisor. The result is that the ranks of maintenance gangs became filled with men whose primary qualification is a strong back. Any other qualifications were incidental and accidental, and it is surprising that men employed under this plan have been as susceptible to training in safety as our records show that they have been.

Perhaps there was a time when we had little latitude in choosing men for maintenance work, and were forced to accept any whose services were offered. However, in view of the prevailing trend toward improved living conditions and higher wages for laborers in maintenance gangs, it is my firm conviction that we can secure a better grade of laborers if only we take the trouble to do so. This statement, of course, applies particularly to the selection of men for the regular section gangs and not so much to special labor recruited for short periods. However, it frequently happens that some of the men recruited for special work find their way into the regular gangs, and care should be taken to insure that only such men as are fitted for the more stringent requirements of regular employment should be permitted to make the transfer.

Salesmanship

When new men enter the service, they should be thoroughly grounded in the rudiments of safety and impressed with the fact that strict observance of the safety rules is required. First impressions are the most lasting, and too much stress cannot be placed on the need for careful training of new men. Those who are found to be indifferent or unresponsive should be replaced immediately, both to rid the service of men who do not take the safety of themselves or their fellow workmen seriously, and as an example to those who give evidence of interest in and adaption to the work.

Thus, if new men are to be properly impressed with the importance of safety, supervisors must be salesmen of a high order, and only those who are completely convinced of the necessity of requiring rigid compliance with safety rules may be expected to sell the idea of safety to others. The true measure of a supervisor's success may be estimated by observing the results of his leadership of new men during the early days of their employment.

Supervision

After men have been well grounded in the rudiments of safety, it is necessary that supervision be continuous and not spasmodic. If men find that supervision is lax and they are permitted to violate safety rules with impunity, it is only human nature for such men to grow careless and forget their earlier training. Supervisors must be alert to detect any tendency toward carelessness or unsafe habits and must correct such faults promptly, particularly before the transgressor gains the impression that the supervisor is not mindful of his every act and is inclined to be negligent in requiring that safety rules and good practices must be observed at all times.

As new men are inclined to pattern their acts largely after the habits of employees who have been long in the service it is important that experienced men be required to observe safety rules to the letter. If any employee, regardless of the length of his service, is permitted to grow careless, it cannot be expected that others will remain unaffected.

Supervision should be firm, but friendly; men should be made to feel that the supervisor is their friend rather than to acquire the impression that he is a tyrant who is only looking for an excuse for criticism rather than a reason for commendation. Good work should be commended as quickly as poor work is criticized. The successful supervisor takes time to explain a bad practice and its dangers, and fully as much time to explain the details of good habits and their value. To tell a man that he is doing something wrong without telling him how to do the job correctly, is to do less than half the task, and may well result in confusion and resentment on the part of the man who is at fault. If so, the final result cannot possibly be satisfactory, and the responsibility rests squarely upon the supervisor rather than the workman.

*Paper read before a regional meeting of the Safety Section, Association of American Railroads, at Dallas, Tex.

Provide Grouted Base For Tracks in Busy Street

THE Kentucky & Indiana Terminal recently replaced a wood plank crossing with a monolithic concrete crossing without restricting rail movements or causing serious interference with vehicular traffic, although the work involved six tracks across a busy city street. The crossing in question is at Thirteenth street and Magnolia avenue, Louisville, Ky. At this point two main and two industrial tracks occupy Magnolia avenue, while two other tracks are located just outside the limits of Magnolia avenue, all six of which cross Thirteenth street.

Thirteenth street carries a heavy vehicular traffic, being one of the main arteries in this section of the city. The main tracks handle the heavy traffic of the Chicago, Indianapolis & Louisville and the Southern, in addition to the trains of the terminal company. There is also considerable switching across Thirteenth street in connection with the operation of the industrial tracks, although one of these tracks was not in use during the time the crossing was under construction.

Maintenance Expensive

Because both the rail and street traffic were heavy, the maintenance of the plank crossing was troublesome and expensive, while the crossing was never very satisfactory. After some negotiation, the railway agreed to install a crossing that would be satisfactory to the city, and the department of public works prepared the plans and specifications for a type of construction which would conform to the character and importance of the street.

Recognizing that the heavy rail traffic demanded a stable foundation to prevent settlement of the tracks, with consequent repetition of the unsatisfactory conditions which it was intended to correct, the plans called for load-distributing slabs under the tracks, to be formed by filling the voids in coarse stone ballast with a cement-sand grout. The accompanying sketch shows the construction.

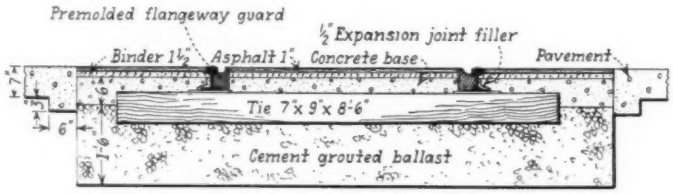
To construct the slab, the track was first skeletonized, that is, all of the ballast was removed to the bottom of the ties. Short sections were then excavated to a depth of 1 ft. below the bottom of the ties and new coarse ballast was placed under the ties and carried to a level about 2 in. above the bottom of the ties, after which the ties were tamped on the new ballast. This process of skeletonizing, excavating, applying the ballast and tamping was continued progressively until all of the tracks in the crossing were supported on 12 in. of new stone ballast. By doing the work in short sections it became possible to carry out this part of the project with scarcely any interference with street traffic, except to slow it down slightly.

After the ballast was applied, traffic was allowed to pass over the tracks for several days to insure that the ballast would be compacted thoroughly. During this period the tracks were surfaced at least twice, and oftener if necessary, to correct those irregularities which always develop under traffic when new ballast is applied. When it was certain that no more settlement was likely to occur, grout was applied until the voids in the ballast were filled.

Immediately after the grouting was completed, mixed concrete was deposited on the grouted base to an elevation 2½ in. below the top of the rail. This work was also done progressively under traffic. As soon as the concrete had hardened, a pavement surface was applied, consisting of a 1½-in. asphalt binder course and a 1-in. rock-asphalt wearing surface. Premolded rail filler strips were embedded in the concrete to form flangeways. On the outside of each rail an expansion-joint filler, ½ in. thick, held the concrete from direct contact with the rail.

The specifications called for rock ballast having a maximum size of 2 in. The proportioning requirements for the grout were 870 lbs. of cement to 2,200 lbs. of medium sand, and 8½ gal. of water to the bag of cement. Reducing these weight requirements to volume gives about 1½ cu. ft. of sand, loose measurement, to each bag of cement.

As has been mentioned, one of the industrial tracks did not carry any traffic at the time the crossing was under construction. It was interesting to note, therefore, that this idle track took a considerably greater volume of grout per foot of track than either of the main tracks which were in almost constant use, since the ballast under them was well consolidated before the grouting was started.

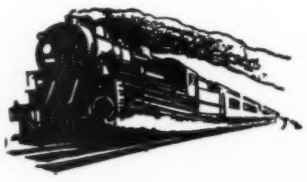


Section Through the Crossing Showing the Grouted Base

Cost of Project

Averaging the labor rate at $0.40 an hour, the cost of skeletonizing and excavating below the ties was approximately $1 per foot of track. Since this cost is based on the total excavation, including the track not under traffic, it is estimated that the cost of the excavation under traffic was $1.15 per track foot. Using the same hourly rate for applying the ballast, the cost of the ballast for all six tracks was $0.76 per foot of track. This figure includes the cost of wheeling about one-half of the ballast a distance of 40 ft. and placing it under traffic.

The entire project was carried out by the regular maintenance forces of the Kentucky & Indiana terminal under the general direction of W. S. Campbell, vice-president and general manager, and under the immediate supervision of G. C. Bailey, roadmaster. During the entire period there was no delay to rail traffic and no slow orders were in force. Obviously, since it was necessary to occupy a small part of the street during the progress of the work, vehicular traffic was slowed down somewhat at times in order to route it around the obstruction, but this traffic was not stopped or interfered with seriously.



To Whom Should Operators Report?

To whom should the operators of roadway machines report? Why? Does the type of machine or the class of work it is doing make any difference?

To Supervisor

By W. F. Miller
Engineer Maintenance of Way, Pennsylvania, Harrisburg, Pa.

Operators of roadway machines should report to the supervisor or roadmaster in charge of the district on which they are working, so far as the use and operation of their machines are concerned. The supervisor is normally in charge of all roadway maintenance work that is being carried out on his territory and should be, therefore, in direct charge of the operation of all machines working within his jurisdiction. On the other hand, machine operators should be responsible to and receive instructions from the supervisor of work equipment with respect to the details of the care, maintenance and repair of their machines. The type of machine or the class of work upon which it is being used does not affect the advisability of following the course outlined in the foregoing.

Must Get Full Output

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

Operators of roadway machines should report to the foreman in charge of the work upon which they are engaged. The foreman is responsible for the execution of the plans covering the work and for the performance of the machines. There can be no divided authority with respect to either the planning or the performance of the work to be done by a machine. The main responsibility of the operator is to see that the machine he is handling gives maximum output without interruptions that are traceable to him or the machine. There is no more point to having machine operators on the railways report to anyone other than the foreman in charge of the work than there would be in operators of machines working for contractors reporting and being responsible to anyone other than the foreman or superintendent who is in charge of the contract job.

It is generally safe to assume that the type of machine or the type of work upon which it is engaged have no bearing on who should have charge of the operators of the power machines.

No Divided Responsibility

By L. B. Holt
Engineer of Track, New York Central, Cleveland, Ohio

Operators of roadway machines should report to the supervisor of track on whose territory they are working. The supervisor is responsible for the safe condition of the right of way, the roadbed and the track, as well as for the safety of employees, and must know that all tools, roadway equipment and power machines used on his territory are safe and in condition for use.

When using machines such as draglines, locomotive cranes, ditchers, ballast-cleaning devices, weed burners, mowers, welding outfits, rail-laying machines, adzers, bolters, track oilers, etc., it becomes necessary to conduct the work in such a way as

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in March

1. What precautions should be taken to prevent accidents when tools are being carried on motor cars?

2. How does one make an inspection of the under-water portions of masonry substructures?

3. When renewing rail on track having irregular gage, should the first line of new rail be gaged to the old rail? Why? If not, how should it be gaged?

4. What is the best floor for freight-transfer platforms and freight houses, with particular reference to trucking? Why?

5. What measures can be employed to overcome surface slides that occur on the slopes of cuts or embankments as frost leaves the ground or during rainy seasons? How should the protection be maintained?

6. Who should be responsible for seeing that pumpers carry out instructions with respect to the operation of their plants? For their cleanliness? Why?

7. What methods should be employed to keep yards clear of scrap and rubbish during the winter? At other seasons? What provisions should be made for disposing of this material?

8. Should the old paint be removed from wood surfaces preparatory to painting? From steel surfaces? Why? What satisfactory methods can be employed?

not to interfere with train operation, or create any hazard to the regular section forces.

During the operation of special roadway machines there must be no divided responsibility. The supervisor should have full opportunity to plan the use of the machines so as to obtain not only the utmost output from them but also to insure that they will be used in harmony with the regular maintenance organization and its program of work.

In view of the foregoing, it is imperative that the operators of roadway machines report to the supervisor and be responsible to him. He is responsible not only for the work on his territory but for all safety requirements with respect to employees and structures, for which reason it is essential, regardless of the class of work or types of machines involved, that the machines be employed under his direction.

To Immediate Superior

By C. E. Miller
Assistant Engineer of Maintenance, Chicago & North Western, Chicago

In conformity with the principles of successful organization, operators of roadway machines should report to their immediate superior. In gang organization, such as for laying rail and surfacing, the immediate superior will be the foreman, since he is the person directly responsible for the progress of the gang and for the quality of the work. He must, therefore, have supervision over all members of his gang, whether they be operators of roadway machines or engaged in other phases of the work. There must be no cases of divided authority or responsibility if the foreman is to fulfill his function as a foreman. If a work-equipment machanic is assigned to maintain the machines and instruct the operators with respect to their proper use and care, he too should be under the jurisdiction of the foreman, and the foreman should co-operate with him to see that the operators carry out these instructions.

Many units of work equipment, such as mowers, discers, ballast scarifiers and similar machines, are used progressively over a district or division, and thus are not under the jurisdiction of a foreman. In such cases the operators should report to the supervisor or roadmaster on whose territory the work is being done.

The same principles hold with respect to operators of machines used in bridge and building work. If they are used in conjunction with a crew organization, the operators should report to the foreman in charge of the crew.

Finally, so far as reporting is concerned, there should be no distinction between the man who operates power machines and the man who works with hand tools. All must be entirely under the jurisdiction of the foreman in charge of the job, but on special work which is handled directly under the roadmaster, the operator should report to him.

Elevation for Ballast Decks

Is it preferable to provide superelevation in the bents of a ballast-deck trestle, or should this be done with ballast? Why? Should there be a limit to the maximum or minimum elevation in either? Why? If so, what should this limit be?

80 Miles of Ballast Decks

By S. F. Grear
Assistant Engineer of Bridges, Illinois Central, Chicago

Since the Illinois Central has approximately 80 miles of ballast-deck trestles, we have given much thought to the matter of superelevation for curves. We have found, however, that the solution of the problem must be based on experience rather than on mathematical formula. Our standard ballast-deck trestle has six-pile bents, lapped stringers and transverse floor planks to carry the ballast. Bents for tangents have two center piles driven plumb, two intermediate piles with a batter of 1 in. per ft., and two outside piles with 2 in. of batter.

For a number of years elevation has been provided as follows: (1) For a superelevation of less than 1 in., the bents are cut level and the outer rail is raised on ballast; (2) for elevations from 1 to 3 in., inclusive, the bents are cut parallel to the plane of the rails; and (3) when more than 3 in. is required, the bents are cut to provide 3 in. of elevation and the remainder is taken up in the ballast.

This method requires the changing of the batter of the piles to insure the desired stability of the bents, this change amounting to 3/16 in. for 1 in. of elevation and ½ in. per ft. for 3 in. of elevation, for all piles except the fourth pile from the inside of the curve, which has the greatest change. Thus, when the bent is cut for 3 in. of elevation the result, numbering the piles from the inside of the curve, will be as follows: Pile No. 1 will slope at the rate of 1½ in. per ft., and pile No. 2 will slope ½ in. per ft. toward the outside of the curve. The remaining piles will have a batter toward the inside of the curve at the following rates: Pile No. 3, ½ in.; pile No. 4, 1 in.; pile No. 5, 1½ in.; and pile No. 6, 2½ in. It is our experience that the placing of the batter in this manner results in a bent that is more resistant to the centrifugal forces acting on the structure, since the resultant of all of the forces acting on the structure is brought more nearly into line with the piles. It also avoids the necessity for placing a large amount of ballast against the guard timbers on the high side of the curve, thus reducing what might otherwise be an excessive height for this bulkhead.

To insure proper spacing and batter of the piles, each foreman is provided with plans showing the spacing at the ground line for any height of bent, a separate print being furnished for the standard bent and for those for 1 in. and 3 in. of superelevation, respectively. This enables the foreman to start each pile exactly where it belongs and with the proper batter, without the necessity for field computations, and it has resulted in a marked improvement with respect to uniformity of bents. I believe that this method insures maximum stability for the track and bridge.

Prefers It in the Bents

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

It is my experience over a term of years that the superelevation should be placed in the bents, reaching its maximum at 5 in. for single track and 3 in. for double track. We have found that track-surfacing costs are less where this is done. The labor cost of constructing the bridge are not affected, but some material is saved because the ballast retainers (parapets) need not be so high as when the elevation is made with ballast. There is also less "jiggling" of the ballast, thus reducing the amount of surfacing. Where the superelevation is

provided in the bents the resultant of the forces acting on the bridge is normal, or approximately so, to the caps and thus parallel to the vertical axis of the stringers, eliminating the tendency to tip outward during the passage of trains at speed.

The difference in the maxima for single and double track is suggested because it is desirable in the latter case to have the respective outer and inner rails of the two tracks at the same level, and this can be done if the elevation provided for in the bents is no greater than 3 in., with no material increase in the amount of ballast, while the tendency of the ballast to shift to the low side of the deck is greatly reduced, and the ballast retainers do not need to be unreasonably high.

We have two ballast-deck bridges not far apart on one of our divisions, each of which has 5½ in. of elevation. In one, the elevation is provided in the bents, while in the other it is made with the ballast. Close attention has been given to these structures for the last seven or eight years, and it has been noted that the section forces must do more work to keep the track on the latter in surface than on the former. The bridges are of the same construction, except for the method of providing elevation, of the same material and age, while the speed and volume of traffic do not differ. The ballast on the bridge having all of the elevation on the ballast, seems to roll out and allow the track to get out of surface more quickly. There seems to be more movement and vibration in the deck where the stringers do not receive the load vertically.

Partly in the Bents

By F. H. Cramer
Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

In considering this question we find that four elements are involved: (1) the rate of curvature; (2) the eccentricity of the structure; (3) the centrifugal forces acting on it; and (4) the superelevation that must be provided, this often being a compromise, depending on the spread between the normal maximum and minimum speeds of trains. It is also obvious that the construction that would be best for the highest speeds may not be best when a train is stopping, standing or starting.

In general, trestles must be built today for higher speeds than formerly, ranging up to 90 miles an hour for passenger trains and to 60 miles or more for freight trains, and the superelevation must be adjusted accordingly, say, up to 5 or 6 in. It has been customary in the past to provide this elevation, say up to 3 in., with the ballast, leaving the deck level, for up to this point it is not specially difficult to hold the ballast in place with a parapet of reasonable height. On the other hand, designs have been used in which all of the elevation is provided in the caps. In these designs, however, the construction of the bents is complicated by the changes which must be made in the batter of the piles, although the floor system is simplified. One of the disadvantages is that since the stringers are not vertical they display a tendency to twist under very low speeds or under standing trains.

Where the elevation is greater than 3 in., I recommend that one-half of the elevation be provided in the bents and that the other half be made on ballast. As an illustration, assume an elevation of 5½ in. In this case, if all of the elevation is given in the bents, the slope of the deck for single track will be slightly more than 1 in. per ft., and the high side of the deck will be about 15 in. higher than the low side. Experience has shown that it will be quite difficult to hold the ballast in place, for it has a tendency to run to the low side in an effort to level itself off under the vibration of passing trains, thus leaving insufficient ballast around the ties on the outside of the curve. The accumulation on the inside will eventually begin to spill over the parapet on the inside of the curve unless it is raised, particularly if the ballast material is fine.

Again, by placing a wedge-shaped corbel over the full length of the cap, to incline the deck as before, but leaving the bents unchanged with the cap level, any desired amount of elevation, but not more than 3 in., can be placed in the deck. If this plan is followed, the bents should have extra-heavy sway bracing to resist movement under passing trains.

Leakage Between Staves

What causes leakage between the staves of wooden tanks? How can it be stopped?

Two Principal Reasons

By W. C. Harman
Supervisor of Bridges and Buildings, Southern Pacific, San Francisco, Cal.

There are two principal reasons why leaks occur between the staves of wooden tanks, namely, expansion of the hoops and the drying out of the staves by reason of low water in the tank. Other causes include poorly fitted staves, improperly sized bottoms and vibration from water hammer and trains.

Hoops expand in climates where the sun heats them excessively, and the tanks will often leak during the heat of the day and close up during the night and cooler hours of the day as the hoops contract as the temperature decreases. This form of leakage can be overcome only by an excessive tightening of the hoops. It is not advisable to do this, however, for it will pull the staves in to the point where the joints will open on the interior face of the tank. Once this occurs and foreign matter floats into the opening thus created it will be difficult to make the staves absolutely tight thereafter. Furthermore, the heavy pressure thus applied crushes the exterior edges of the staves, and this also tends to make a bad joint.

Exceptional care should be exercised in adjusting hoops to a tank to insure that they all have equal, but not too much, tension. Many wooden tanks now in service show evidence of lack of this care. This can be recognized by the fact that the staves are concave instead of straight vertically, and by the further fact that they are out of their proper positions in the circle.

In the past, service tanks were usually placed close enough to the track to permit water to be taken directly through tank spouts. This close proximity to the track subjects them to vibration from passing trains. This vibration, to which must be added the shocks created by closure of the tank valve, induces stresses throughout the entire structure which continually shake the tub and doubtless cause some leaks which might not occur in tanks set further back from the track. We have had tanks which, after a few years of service, have developed leaks which could be attributed to no other cause than vibration.

Poorly fitted staves and bottoms of improper size will leak from the start. When too large, a bottom will cause leaks because the staves cannot be drawn up tightly, while one that is too small will cause leaks in the chimes through the croze for the reason that the stave circle is too large. Leaks caused by these deficiencies can

be checked temporarily with white lead at the time the tank is erected, but this is only a temporary expedient for the white lead will eventually leach out or lose its life and trouble will start.

In the foregoing, I am assuming that the tank is being kept full of water. Where the water level is subject to fluctuation we may find the staves drying out at the top, with consequent shrinkage of the wood sufficient to open the joints and allow leakage. This is a very difficult condition to overcome. For this reason I believe that wooden tanks should be used only for storage and not for service where they will be subject to vibration and to fluctuations of water level.

Leaks caused by poorly fitted staves or decayed members are also quite difficult to overcome except by emptying the tank and working on it from the inside with tar or paint. Tanks that have been properly fitted and erected can be kept tight by maintaining the hoops at the proper tension.

In no case should hard wedges or plugs be driven between the staves as this will make the condition worse instead of correcting it. When hoops are tightened they should be tightened alike. Where staves dry out to the extent that leaks start, allowance should be made for the swelling of the wood when it again becames saturated; otherwise buckling of the stave circle may result.

Calk with Oakum

By J. P. Hanley
Water Service Inspector, Illinois Central, Chicago

Most of the wooden tanks now built are 30 ft. in diameter and have staves 20 ft. high. The erection of these tanks calls not only for the usual skill of the carpenter, but special experience in wooden-tank construction. The particular knack required by the tank carpenter is that of adjusting the closure or "pull" on the joints between the individual staves, on the joints between the bottom planks and on the joints between the staves and the tank floor to insure that all of these joints will close at the same time. If this is done in the way it should be, when the hoops are tightened to their final tension or set, all of these joints should be water-tight without the necessity for calking.

On the other hand, if the joining is not done to the required nicety, there will be many small seams which will permit leakage. These may occur between staves, between floor planks and at the junction of the staves and tank bottom. One of the methods employed to stop this leakage is to calk the seams with oakum and plaster the interior surface with a leak-prevention compound. Some tank timber exhibits a tendency to leak through the body of the wood itself, in which case the anti-leak compound is usually effective. Leak compounds should be applied only after the timber surface has been cleaned, two coats being more effective than one. Each coat should be applied about 1/8 in. thick and water should not be turned into the tank until they are thoroughly dry.

In some cases, leakage develops by reason of low-water level in the tank, which allows shrinkage to develop as the staves dry out. Where this has been allowed to occur, an application of front-end cinders, sawdust or other floating filler may be beneficial. The filler should be applied around the inner circumference of the tank while the water is low, and as the water rises and flows into the shrinkage seams it will carry the filler into them, closing some and holding moisture in others until they swell and become tight.

If shrinkage has been allowed to develop to the point where the seams become well opened, or if the condition is of long standing, it may be necessary to erect scaffolding and tighten the hoops. Since it is quite expensive to do this, it should be resorted to only after other methods have failed to stop the leakage.

Daily Patrol in Winter

Is there any special merit in daily track patrol during the winter, as compared with other seasons of the year? If so, what? If not, why?

Is More Necessary

By H. R. Clarke
Engineer Maintenance of Way, Chicago, Burlington & Quincy, Chicago

Some years ago there was more merit in daily track patrol during all seasons than there is now. The lighter rail and angle bars in use at that time, with ties that were largely untreated, few if any tie plates, and with a ballast condition in no way comparable with that now on most roads; in brief with a track structure not nearly so strong as it is today, defects developed much more rapidly and frequent patrol of the track was fully justified. The absence of automatic signals and the protection they afford was another factor to be considered.

Today, with stronger track, defective conditions, with the possible exception of broken rails, seldom develop quickly and checks of the conditions found and the results accomplished by daily patrol showed clearly that such frequent patrol was not nearly so necessary as it once had been. Automatic signals with which most high-speed lines are now equipped afford almost certain protection against broken rails, except for the train under which the break occurs and, of course, no patrol would be of benefit in this case.

Patrol of all tracks with sufficient frequency to insure against defects developing and flangeways becoming filled up, and to inspect general conditions, such as line, surface, fences, bridges, telegraph lines, etc., is still required. On important, high-speed, heavy-traffic main lines, it is the general practice to patrol track by some means at least every working day.

During the winter, conditions are more severe and the need for track patrol is greater. Failure of rails, angle bars, bolts, etc., is more frequent during periods of extreme cold and when the roadbed is frozen solidly, and spread track is more likely to develop then than when the roadbed is elastic. As a rule, more trouble is experienced with flangeways and highway crossings during the winter than in other seasons, particularly if alternate freezing and thawing occurs, and the hazards in case the flangeways become filled is increased greatly during freezing weather. For all of these reasons, track patrol is more necessary during the winter than during other seasons of the year.

There Is Special Merit

By J. E. Padgett
Roadmaster, Missouri Pacific, Coffeyville, Kan.

There is special merit in daily track patrol during the winter as compared with other seasons, for as the temperature falls below freezing, rails are more likely to break and this tendency increases as the temperature decreases. Furthermore, more bolts break during cold than hot weather. In freezing weather road crossings must be watched more closely to insure that planks do not heave as a

result of snow and ice being crowded under them. Again, the track must be watched for soft places when alternate freezing and thawing takes place, and this is particularly important during the late winter and early spring when frost is going out of the ground. During warm weather one does not have any of the foregoing conditions to contend with.

Believes in It

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

I am an advocate of regular daily track patrol on high-speed, heavy-traffic lines, and I believe that it is specially necessary during the winter when so many conditions prevail that do not exist in warm weather. Rails are more likely to break when the temperature drops below freezing, more bolts break or are sheared off by the rails as they contract, while more joint bars break during the winter.

There is greater danger of spreading track when the roadbed and track are frozen rigidly than when they are free of frost. Again, snow and ice create hazards around frogs, guard rails and switches that do not exist when the weather is warm. The same is true of grade crossings. In many cases these troubles are increased during periods of alternate freezing and thawing.

I believe that regular daily track patrol on important main lines is fully justified. I also believe that for the reasons stated it has special merit during the winter when so many things can happen on short notice, owing to the adverse conditions resulting from low temperature, sudden changes in temperature and the occurrence of winter storms.

Is More Important

By L. J. Simons
Section Foreman, Chicago & North Western, Beaver, Iowa

While daily track patrol is always important it becomes increasingly so during the winter and the early spring months when thawing sets in. Much can be said on the subject, as there are so many things that can go wrong, such as heaving track, alternate freezing and thawing, blocked drainage in culverts, cuts and other ditches, snow and ice in flangeways of grade crossings, all of which create hazards. Bolts and angle bars break more readily when it is cold or the weather alternates between high and low temperatures, by reason of the contraction and expansion of the rails. Broken rails are the most important of all, although they are generally checked by the signal and train-control circuits. On the other hand, I have found rails broken near the ends between the junctions with the bond wires. This type of break cannot be checked by anything less than a track inspection. Our road, in common with certain others, is gradually applying welded bonds which will lessen this danger.

From experience, I find it quite satisfactory to walk over my territory once a week, because a more thorough inspection can be made in this way than from a motor car. If it is snowing or blowing one is wrapped in heavy clothing and it is quite easy to overlook defects, particularly if the track is filled to the top of the rail with snow.

Can Painting Be Done Locally?

Is it practicable to have bridge and building painting done locally by contractors? What are the advantages? The disadvantages?

Certain Minor Items

By F. R. Layng
Chief Engineer, Bessemer & Lake Erie, Greenville, Pa.

It is practicable to have certain minor items of bridge and building painting done by local contractors, such as replacement of broken glass, the painting of old or new woodwork made necessary by minor repairs or alterations, and the painting of metal eaves troughs, valleys and ridge rolls. In some instances it may be practicable to contract the painting of an entire building or a group of buildings, depending on the circumstances surrounding the case.

The factors that must be considered in arriving at a decision include (1) the amount of travel time involved if done by company forces; (2) whether the work is urgent, requiring immediate attention; and (3) whether the magnitude of the job will require the employment of forces in addition to the regular forces and, if so, whether there will likely be inexperienced men on the job, possibly resulting in poor workmanship and accidents.

Where contract work is contemplated it is desirable that only the labor be contracted and that the material be furnished by the company, since only in this way can control be maintained over the quality, for contractors scattered along the line may differ widely in their judgment as to what constitutes the best material for a given purpose. While this can be controlled by specifications and inspection, this is hardly a solution for small jobs, and the high cost of small lots of material, together with the cost of inspection, would defeat the purpose of contracting the work.

It seems preferable to have experienced railway painters do bridge painting because of their knowledge of operating rules and practices, as well as of their training with respect to railway standards. Nevertheless, there are circumstances which make contract work preferable, such as a large structure requiring several months to paint.

There is an advantage in contracting work which for various reasons cannot be included in the regular program of the maintenance painting forces by reason of its remote location from headquarters, making it necessary to pay for too much non-productive or dead time. Among the disadvantages, many structures are not readily accessible except by track motor cars or camp car outfits. It is not desirable to have outsiders who are not trained in railway practices do this class of work. Again, trained railway painters are generally able to maintain a better standard of painting than contractors.

Results Are Satisfactory

By Engineer Maintenance of Way

From 1930 to 1935 we disbanded our paint gangs and did no painting. More recently painting has been resumed on a small scale but at widely separated points, the program being such that it is not practical to reorganize company gangs at this time to handle the work. The work that has been done so far has been done by local contractors, the practice being to make an agreement with a single contractor to do all painting that is scheduled within a limited territory adjacent to his headquarters. Competitive bidding has been obtained and the work has been let on the most favorable bid, based on a unit price per square foot for one and two-coat

work, for both exterior and interior painting. It has been our practice to furnish all paints and oils, the contractor furnishing the labor, the scrapers, burning equipment, etc.

The contractors have also agreed to do small jobs of repair work which it is desirable to have completed ahead of the painting, the schedule of this work being prepared after a joint inspection of each job by the contractor and a representative of the railway. We have found the results satisfactory from the standpoint of less cost than would have been possible with company forces, taking into consideration the widely separated points involved, the loss of time in moving from one job to another and the relatively small amount of work done. It has been our experience that the plan has no important disadvantages compared with handling the work with company forces.

Extending the Life of Roofs

Is it practicable to extend at relatively small cost the life of a slate or tile roof which has begun to disintegrate? A metal roof? If so, how?

Replaces Broken Units

By E. A. Harrison
Architect, Atchison, Topeka & Santa Fe, Chicago

We have relatively few slate or metal roofs. Our stations and hotels are generally roofed with tile, and after a service extending over more than 30 years are still in first-class condition and are requiring very little maintenance. It is true that some breakage occurs and that replacements must be made. These are made from stock which is generally carried over from the erection of the building.

The few slate roofs we have are on steep slopes and have stood up very well, although it has been necessary to replace one that was on a pitch of 1 to 5. Several metal roofs are intact after 50 years of service. These roofs were laid with old-style terne plates which, if kept painted, appear to be indestructible. I suggest the use of plastic cement for patching metal roofs. While this is more or less temporary, the life can be extended for several years at small cost.

Uses a "Baby"

By O. W. Stephens
Supervisor of Bridges and Buildings, Delaware & Hudson, Watervliet, N.Y.

Our slaters remove all broken and loose slate, together with the nails, the latter by means of a slating tool. This latter is important because the new slate cannot be placed properly unless the old nails have been removed. The new slate is then inserted beneath the overlapping course and marked for punching. The nail hole should be as close to the edge of the overlapping slate as practicable and, if possible, it is placed in the joint between the two slates of the next higher course to insure against breakage of the underlying slate.

To protect this nail as well as to prevent leakage through the nail hole, a piece of sheet zinc 4 in. by 6 in. in area is inserted over the top of the new slate, this plate being known commonly as a "baby." To hold it in place, we bend it to a convex surface and force it into place. We find that it has sufficient spring action to hold it in place. If the roof is of red tile we substitute copper for the zinc. While the zinc and copper match the color of the respective roofs better than tin or galvanized iron, the important consideration leading to their use is that they outlast the latter two metals. We have tried putting roofing cement over the nail heads, but do not favor it because it gives the roof a spotted appearance.

The usual method of replacing loose or missing slate is to insert the new slate as before and hold them in place with slate hooks, these being made of round galvanized iron. We believe, however, that the "baby" is superior because slate hooks rust at the exposed or hook end and eventually allow the slate to fall out.

Organizing for Welding Rail

How should a gang engaged in building up battered rail ends be organized to insure a properly balanced operation?

Five Distinct Questions

By C. E. Morgan
Superintendent of Work Equipment and Welding, Chicago, Milwaukee, St. Paul & Pacific, Chicago

This question presents itself to every one engaged in rail reclamation, but resolves itself into five distinct questions: (1) How many miles are to be built up; (2) how long will the working season be; (3) how much welding equipment is available without further capital outlay; (4) will there be an increase or decrease in the amount of work to be done in succeeding years; and (5) how many trained welders and grinders are available. Surface grinding is essential to successful welding, and it has been my policy to build the whole crew around the grinding operation. I do not like a crew with less than one grinder to each rail for, since a foreman is necessary to oversee the work, it is desirable to spread the overhead charges over as much work as can be done practically.

If a crew built around two surface grinders cannot complete the required amount of work during the season, I would go to four grinders. If the welding is to be done with gas, I would use 8 welders and 2 surface grinders or 4 grinders and 16 welders. In either event 1 man can keep up with the cross grinding and 2 men will do the flagging. If it is an electric welding job, I would use 2 arcs, 1 roughing grinder and 2 finishing grinders, 1 preheater, 1 cross grinder and 2 flagmen or, if there is sufficient work to justify it, a crew almost double this size, that is, 2 preheaters, 4 arcs, 1 roughing grinder, 4 finishing grinders, 1 cross grinder and 2 flagmen.

The length of the season is also tied up with the size of the crew, since the larger crew will result in a lower unit cost, provided the necessary equipment is available and the fixed charges arising from its ownership can be spread over several years. These charges should be based on a life expectancy of not less than five years or more than eight, depending on the number of months per year that it can be used. At least 10 per cent of the purchase price should be used to estimate the annual maintenance cost.

If the general trend is toward a decrease in the amount of welding, a smaller crew and a longer season will

justify a higher unit cost so that the equipment will not be idle in later years. Another important factor in organizing for a balanced operation is the geographical location of the work. If it is all out-of-face, the larger crew will be more satisfactory. If it occurs in short sections, say not more than 10 miles in any one place, the smaller crew will probably be more effective, for starting and finishing can be done by the small crew with less waste of time.

The availability of trained men should not be overlooked, since the training of men to weld on high carbon steel is not as simple as it is for low carbon steel. Good rail welders find little difficulty in handling structural steel or shop welding, but the reverse is not true, for good welders on low-carbon steel may be utter failures when placed on track work. Some men cannot learn to make gas welds on rail; it is not only a trade, it is an art. However, the difficulties in training arc welders on rail work are becoming less as we gain more experience with this type of welding.

Grinding Limiting Factor

By Division Engineer

Obviously, to get a balanced operation, enough men should be engaged in each phase of the work so that all parts of it will progress at the same rate. In welding, the limiting factor is the rate at which the surface grinding can progress. In gas welding there is no limit, within reason, to the number of welders that can be employed. There is a limit, however, to the number of surface grinders, by reason of the size and cost of the grinding machines.

As it takes one grinder to keep up with approximately four welders, depending somewhat on the condition of the rail and the average length of the welds, the number of welders will be limited by the number of surface grinders to be employed. For scattered work which occurs in short stretches, a gang consisting of 1 surface grinder, 4 welders, 1 helper, 1 slotter and two flagmen will probably be most satisfactory. If the job is extensive out-of-face work, the number of surface grinders should be increased to two, one for each rail. In exceptionally large jobs, four grinders, two for each rail, can be employed, this being about the limit, however, as a larger number will make the cost of the equipment unnecessarily high.

With the larger gangs there should be at least one helper to each four welders, and it may be desirable to include a small gang with light motor cars to handle the gas cylinders to insure that the welders will be able to work without interruption. One slotter with a helper should be able to keep up with even the largest gangs, while two flagmen, as before, are sufficient. If two or more grinders are employed, a mechanic should be assigned to keep the machines in condition. I cannot discuss the organization required for electric welding, for I have had no experience with this type of work.

Making Crossings Safe in Winter

What special steps should section forces take to insure against accidents at grade crossings during the winter?

Watch Highway Forces

By District Engineer

Two kinds of accidents are most likely to occur at crossings during the winter which are different from those at other seasons, namely, derailments of trains and damage to highway vehicles. The former can usually be avoided by proper attention to keeping flangeways clean. While I do not want to minimize the importance of doing this, it is more or less routine and will be passed for another matter that has given us considerable trouble.

I refer particularly to the use of snow-removal equipment by the highway forces. We are in a heavy-snow country and both ourselves and the highway department are often called on to fight snow storms of varying severity. At first, the forces engaged in clearing the highways ran their equipment across our tracks, paying no attention to the accumulations of snow they left upon them. If a train passed shortly thereafter, the snow ridges were leveled down and scattered and later vehicles dragged the snow and packed it in the flangeways, creating a serious hazard.

We found, however, that this was done largely through thoughtlessness based on ignorance that a hazard was being created to either trains or vehicles, and that those in authority were not only willing but glad to co-operate with us in every way to eliminate the trouble. Through this co-operation we now have little difficulty with what was once a menace.

In conjunction with the highway forces, we now level down the snow on both sides of the track, keeping it away from both the rails and the pavement in such a way that when a thaw sets in the water is led away to prevent ice from forming on the pavement of the approaches and on the crossing itself. We take other measures as may be necessary to prevent accumulations of snow and ice on the crossings and approaches with a view to keeping the pavement dry and thus eliminate the probability of skidding. We also follow the same procedure at less important crossings where little or no attempt at snow removal is made. In this way we have reduced the amount of material that is dragged in to the crossings, and find that the problem of keeping the flangeways open after a storm has passed has been much simplified.

Keep Flangeways Open

By Dave Kirkland

Bridge and Building Department, Chicago, Rock Island & Pacific, Fairbury, Neb.

Probably the most serious conditions encountered at crossings during the winter is the tendency of the flangeways to become packed. When this occurs in freezing weather it may cause a derailment. While snow and ice are most commonly at fault, if the highway has a dirt surface, particularly if it is heavy clay or gumbo, and the frost leaves the surface during a warm spell, the material will cling to the tires and be jarred off when they strike the more solid crossing surface. This material is worked into the flangeway and if a sudden freeze occurs it will become hard enough to lift the wheel flanges over the rail. This is more likely to occur on branch lines where there are only one or two trains a day and especially where all trains are scheduled during daylight hours.

This indicates the importance of paying strict attention to the flangeways of grade crossings. On the other hand, winter conditions can be greatly improved by overhauling the crossings before winter sets in, and making certain that drainage and other elements of the crossings are in first-class condition. Unless the road has a hard surface, oiling it for some distance on either side of the track will be of real benefit, since this will permit the dropping of soil accumulations from the wheels before they reach the track.

PRODUCTS of Manufacturers

Speed-O-Matic Speeds Crane Output

MATERIAL handling equipment like the power crane, shovel and dragline has been defined as a means of multiplying the power and extending the length of the operator's arms and legs. This principle has recently been

Involves a Row of Small Handles

carried one step farther in the crane-shovel-dragline machines of the Link Belt Company, Chicago, by introducing the so-called Speed-O-Matic control whereby the energy-output of the operator in manipulating the levers and pedals is reduced to a fraction of that required for the operation of the conventional controls.

This new equipment involves the application of the hydraulic principle. Instead of the usual levers and pedals, the movement of which requires the expenditure of considerable muscular effort, the device embodies a control case equipped at the top with a row of small handles and at the bottom with pedals. The handles and pedals for the clutches and brakes of the various operating functions actuate valves in a manifold that is supplied with oil under pressure by a pump, the opening and closing of these valves controlling the transmission of the oil under pressure through pipes to hydraulic cylinders that operate the various drums and clutches.

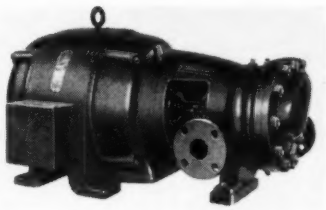
Seated behind this control case, the operator manipulates the various handles and pedals with a minimum of effort, and because he is thus relieved of muscular fatigue, it is claimed by the manufacturer that the output of the machines equipped with the Speed-O-Matic control is maintained at a uniform rate throughout the duration of the working shift, resulting in as much as a 25 per cent increase in production. This control has recently had extensive use on crawler-mounted machines and is now being applied to cranes for use on railway tracks.

A Speed-O-Matic Crane

F-M Two-Stage Built-Together Pump

FAIRBANKS, Morse & Co., Chicago, has developed a two-stage built-together pump which is designed to operate against heads up to 500 ft. The new pump, which is known as Fig. 5592, is said to be adapted for all classes of general pumping service with liquids low in viscosity and free from excessive foreign matter.

The new unit consists essentially of a two-stage centrifugal pump, with enclosed bronze impellers, mounted directly on the shaft of a Fairbanks, Morse splash-proof motor. All the radial and unbalanced thrust loads are taken by two ball bearings. The impellers for the two stages are placed back to back, thereby compensating thrust. Improved hydraulic design is said to be attained by placing the first stage unit next to the motor and the second stage on the outside, simplifying the cross-over passage and placing the stuffing box under suction instead of pressure. A mounting leg under the pump end gives the unit added stability.



The Unit Is Compact

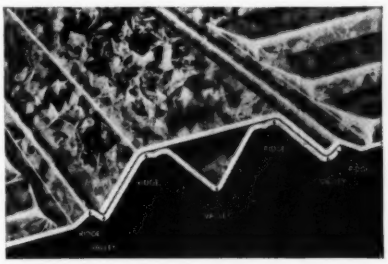
Because of its compact design, the pump is especially advantageous where space is limited. No special foundation is said to be required; the pump is complete in itself and can be mounted in any convenient horizontal, vertical or angular position. The compactness of the pump is said to qualify it for portable and semi-portable service as well as for stationary applications.

Triple Drain Roofing

A NEW roofing product, known as Republic Perfected Triple Drain Channel roofing, has been placed on the market by the Republic Steel Corporation, Cleveland, Ohio. A feature of this roofing is that each channel unit has four ridges and three valleys, thus providing three drainage channels. Because of this innovation, it is said that neither driving rain nor capillary attraction can cause leaks. A beaded channel makes a tight fit at the overlapping edge, creating, it is said, a vacuum action. Any water passing this point is carried into the center channel through the action of gravity.

The new type of roofing is avail-

able in three types of metal—steel, copper-bearing steel and Toncan iron. It is furnished in 26, 28 and 29 gage metal, and in lengths ranging from 5 ft. to 12 ft. with a covering width of 24 in. To facilitate application of the roofing, the proper area for nailing is indicated by blue lines on each sheet.



A Cross-Sectional View Showing Essential Features of Triple Drain Channel Roofing

Portable Air Mains

THE California Corrugated Culvert Company, Berkeley, Calif., is now marketing sections of galvanized pipe which are specially designed for use in transmitting compressed air from the compressor to pneumatic tools. Known as Calco portable air mains, this piping is provided with two-inch outlets at intervals to permit the attachment of manifolds from which air tools are operated.

A noteworthy feature of these air mains is the type of coupling that is used, which is self-contained and is designed to permit lengths of the pipe to be quickly joined and disjoined without the use of tools. The pipe sections are made with male and female ends, and the principal feature of the coupling is a curved lever which is attached to the latter end of the pipe by means of a yoke. The two ends of the yoke are bolted to the end of the pipe on opposite sides in such a manner that the yoke is free to rotate about the bolts. Where the opposite ends of the two legs of the yoke come together, a pin connection with the lever at a point near its lower end is provided. In operation, the end of the pipe to which the lever is attached is inserted over the tapered end of the adjacent section to a point where the end of the lever can be made to engage a lug welded to the latter pipe. When the lever is forced down leverage is obtained against the lug so that the ends of the two sections of pipe are pulled tightly together, forming an air-tight joint. All that is required to loosen the coupling is to pull the lever up. It is said that the only portions of the couplings that ever need replacing are rubber gaskets and these only at long intervals.

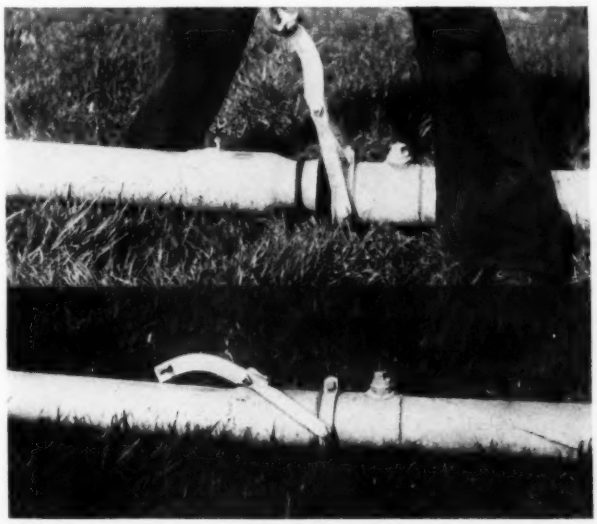
When these portable air mains are used in connection with the out-of-face tamping of track it is pointed out that the traffic hazard introduced by the presence of the compressor on the track is eliminated and that expensive delays to the work are prevented. When the portable mains are used in tamping operations, the compressor is usually set off the track in the morning at a point midway between the end of the previous day's work and the point where it is estimated the day's work will end. Next a line of pipe (usually 2,000 ft. long), is laid from the compressor back to the point where work is to start and the work begins, the manifolds from which the tools are operated being advanced to succeeding outlets as the work progresses.

When the operations have progressed over 500 ft. of track, that section of the line is closed off by a valve and the pipe sections moved ahead of the compressor, where they are relaid, this being done without interruption to the tamping work. This operation is repeated as each 500-ft. section of pipe is left behind so that by the time the gang reaches the compressor the air main has been extended 1,500 ft. beyond it. At the close of the day's work the couplings at the low points in the line can be opened for drainage purposes.

Three-inch and 4-in. air mains are most frequently used but pipe up to 6-in. in diameter is available with the special coupling. It is pointed out that the use of pipe 3 in. or more in diameter reduces friction losses in long lines considerably, with the result that higher pressures are made available at the end of the line. In addition it is said that cool and smooth operation of the tools is facilitated by the use of air mains as a result of the additional storage capacity provided in the pipe.

In addition to being used as air mains in tamping operations, these pipe sections may also be used wherever air, gas, oil or water must be conveyed in temporary lines. The couplings are said to be air-tight, even when they are flexed at very sharp angles.

Showing How the Air Mains Are Used for Piping Compressed Air for Portable Tools



The Two Views Illustrate the Manner in Which the Portable Air Mains Are Coupled

NEWS of the Month

Lower Car Loadings Expected in First Quarter

Freight car loadings in the first quarter of 1938 are expected to be about 8.3 per cent below actual loadings in the corresponding period of 1937, according to estimates compiled by the 13 Shippers' Advisory boards. On the basis of these estimates, freight car loadings of the 29 principal commodities will be 5,084,500 cars in the first quarter of 1938, as compared with actual loadings of 5,543,300 cars for the same commodities in the corresponding period of last year. Of the 13 boards, 3 estimate increases and 9 decreases in carloadings for the first quarter while one board, that in the Southwest region, anticipates practically no change. For the country as a whole, it is anticipated that, of the 29 commodities included in the estimate, 21 will show decreases and 7 increases.

"Snow Train" Season Starts in New York

Sustained interest in winter sports in the New York Metropolitan area has prompted the railroads in that region again to announce the operation of special trains for carrying enthusiasts to surrounding winter-sports centers on week-end trips. In this service a wide range of equipment and rates, some as low as $2 a round trip, are being offered, and with the various railroads operating "snow trains" the winter sportsman has his choice of almost any desirable location in New England and nearby Canada. The snow trains are being widely advertised and as another means of enhancing their appeal they are given such suggestive names as "Ski-Meister," and "Snow Clipper."

C. & O. to Acquire Nickel Plate and Erie

Renewed impetus to the railroad consolidation movement was imparted recently by the Interstate Commerce Commission when it approved the acquisition by the Chesapeake & Ohio of the New York, Chicago & St. Louis (Nickel Plate) and the Erie through the purchase of capital stock. The latter, in the amount of 57.02 per cent of the Nickel Plate and 55.68 per cent of the Erie voting securities, would be obtained from the Virginia Transportation Corporation and the Alleghany Corporation, both holding companies. The C. & O., in its application to the I.C.C. for permission to carry out the acquisition, stated that the latter constitutes an important and necessary step toward the formation of System No. 6 in the commission's plan of consolidation. It gave as a reason the desire to promote the public interest by simplifying the corporate structure through the elimination of the two holding companies as factors in the relationships between the C. & O. and the Nickel Plate and the Erie. It also mentioned the savings which would result in administration expenses.

Announce Budgets on Three Railroads

During the last two weeks three railroads—the Atchison, Topeka & Santa Fe, the St. Louis-San Francisco and the St. Louis Southwestern (the Cotton Belt)—have announced the approval of improvement budgets for 1938. The budget of the Santa Fe, which was approved at a meeting of the directors at New York on December 21, amounts to $35,192,802, including the carry-over. The expenditures authorized for next year cover improvements and additions to the company's property and include $7,221,049 chargeable to operating expenses.

For the Frisco, an emergency improvement budget of $3,464,336 has been approved in full by Judge George H. Moore sitting at St. Louis, Mo. It was explained that the expenditures involved in this budget will be in addition to a regular maintenance outlay of about $1,700,000 a month. For the Cotton Belt the federal district court has approved an expenditure next year of $1,558,000 for improvements to rolling stock and right-of-way.

I. C. C. Holds Hearings on Rate Increase Appeal

Hearings before the Interstate Commerce Commission on the railroads' application for a 15 per cent increase in freight rates proceeded throughout most of December and, as a result of the stepping up of the hearings schedule, it is expected that the entire case will be in the hands of the commission by January 30. Accompanied by intense interest on the part of all concerned, the first group of hearings commenced at Washington, D. C., on November 29 and were concluded on December 14. During these hearings numerous railroad executives and experts took the stand in support of the proposed increase, and presented a great deal of statistical evidence pointing to the crying need of the carriers for the additional revenue. At the same time it developed that there was little opposition to the increase on the part of shippers. Further hearings on the application will be held at various points throughout the country during January. In addition hearings on the appeal of the eastern carriers for an increase in coach rate from 2 to 2½ cents a mile were begun at Washington on December 23.

President Talks on the Railroad Situation

Considerable encouragement for the railroads can be found in recent utterances of President Roosevelt, particularly those made by him at his conference with representatives of the press on December 10. At that time he declared that he was still firm in the belief that the railroads of this country should be privately operated and, when asked as to what he thought about the railroads' application for a 15 per cent increase in freight rates, he expressed the opinion that final determination of this case should come as quickly as possible. The president expressed grave concern over the railroad problem and went on to say that, while the situation had improved temporarily since the depression low, he did not think there were any members of the Interstate Commerce Commission who thought there had been a permanent solution.

Self-Service Dining Cars on New Haven

An innovation in dining car service has been introduced by the New York, New Haven & Hartford in the form of six new self-service grill cars, each of which will provide the same range of meal service that is customarily rendered by cafeterias. In these cars, each of which will seat 57 persons, the facilities for the preparation and serving of food are located at the middle of the car, with a wide aisle along one side. At one end of the grill counter is a separate section housing a soda fountain where ice-cream, soft drinks and liquors are served. These cars are intended to supplement, rather than to replace, dining cars in the passenger trains of the New Haven. They are provided particularly to serve the large number of coach passengers who are not now attracted to the dining cars, and will provide meals at popular cafeteria prices.

Personal Mention

General

Howard W. McCauley, division roadmaster on the Northern Pacific, with headquarters at Minneapolis, Minn., has been appointed trainmaster of the Minnesota & International (a subsidiary of the Northern Pacific).

J. D. Shea, formerly a roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, who has recently been on special work for the operating department, has been appointed trainmaster with headquarters at Madison, Wis.

John Hewes, Jr., transportation assistant on the Baltimore & Ohio, with headquarters at Pittsburgh, Pa., and formerly a division engineer on this road, has been promoted to superintendent of the Newark division, with headquarters at Newark, Ohio.

Luis G. Morphy, general superintendent and chief engineer of the Rutland, with headquarters at Rutland, Vt., has been appointed general manager, in charge of operation and maintenance with the same headquarters. He will continue as chief engineer. The position of general superintendent has been abolished.

Ulysses S. Attix, who has been appointed general fire inspector of the Southern Pacific, with headquarters at San Francisco, Cal., as reported in the December issue, was born on October 16, 1887, at Mentor, Minn. Mr. Attix received his higher education at the University of California, graduating with a bachelor of science degree in mechanical engineering in 1912. He first entered railway service with the Southern Pacific in February, 1922, as an assistant engineer on the mechanical design and construction of boiler plants, treating plants and water and fuel stations on the Portland division. In December, 1929, he was assigned to the general offices at San Francisco, Cal., as a mechanical designer, in which capacity he handled work similar to that on which he had been engaged on the Portland division. His appointment as general fire inspector in charge of fire prevention engineering on the Pacific System of the Southern Pacific, with headquarters at San Francisco, became effective on November 1.

Robert K. Johnson, supervisor of signals and water supply on the Chesapeake & Ohio, with headquarters at Peru, Ind., has been appointed superyisor of reclamation of the road, with headquarters at Barboursville, W. Va., succeeding **Walter Constance,** whose death on September 10, 1937, was reported in the October issue. Mr. Johnson was born on March 5, 1898, at Rodgersville, Tenn., and received his education in the public schools and through a series of correspondence courses. His railway career began in 1916, when, during his summer vacation, he worked as a signal helper on the Wabash. Upon completing his school work, he re-entered the service of the Wabash in 1917 as a signal helper, and later in the same year, left the railroad to become connected with the Western Union Telegraph Company. In 1918, Mr. Johnson entered the employ of the Chesapeake & Ohio as a signalman, later leaving the company to join the Indiana Bell Telephone Company. After serving this company as a lineman, telephone repairman and switchboard repairman, he returned to the Chesapeake & Ohio in 1920 as a signal maintainer, and in January, 1923, was appointed acting supervisor of signals and water supply, with headquarters at Peru. In June of the same year, Mr. Johnson was appointed supervisor of signals and water supply at Peru, the position he was holding at the time of his appointment as supervisor of reclamation.

George D. Brooke, executive vice-president of the Chesapeake & Ohio, the New York, Chicago & St. Louis (the Nickel Plate) and the Pere Marquette, with headquarters at Cleveland, Ohio, has been elected president of the C. & O., to succeed **William J. Harahan,** whose death is noted

George D. Brooke

elsewhere in these columns. Mr. Brooke was born on September 15, 1878, at Sutherlin, Va., and graduated from the Virginian Military Institute in 1900. Two years later he started his railway career as a rodman on the Baltimore & Ohio, later serving with this company as a levelman, transitman, field engineer, assistant engineer and assistant division engineer. From July, 1809, to March, 1911, he served as division engineer at Baltimore, Md., and at the end of this period he became an assistant engineer in the operating department. On February 1, 1912, Mr. Brooke was further advanced to assistant superintendent at Cumberland, Md., and in Setpember of that year he was promoted to superintendent. From May to June, 1918, he served as a special representative of the transportation department, then entering the service of the United States Railroad Administration as supervisor in the operating division, Allegheny region, at Philadelphia, Pa., which position he held until March, 1919, when he resumed his connection with the Baltimore & Ohio as superintendent of transportation at Cincinnati, Ohio. In August, 1924, Mr. Brooke first entered the service of the Chesapeake & Ohio as assistant to the vice-president at Richmond, Va. In October, 1926, he was advanced to general manager and in the spring of 1930, he was appointed also vice-president. In 1933, Mr. Brooke was given the title of vice-president—operation and engineering—of the C. & O. and the Nickel Plate, with headquarters at Cleveland. Early in 1937, he was elected to the newly-created position of executive vice-president of the C. & O., the Nickel Plate and the Pere Marquette, which position he was holding at the time of his election to the presidency of the C. & O. For many years Mr. Brooke has been active in the affairs of the American Railway Engineering Association and served as president of this organization in 1930-31.

Engineering

George W. Varnum, assistant division engineer on the Atchison, Topeka & Santa Fe, with headquarters at San Francisco, Cal., has been promoted to office engineer in the office of the chief engineer of the Coast Lines, with headquarters at Los Angeles.

Major James V. Johnston, division engineer on the Mobile & Ohio at Jackson, Tenn., has been promoted to the newly-created position of principal assistant engineer, with headquarters at St. Louis, Mo. **V. C. Hanna,** assistant roadmaster at Murphysboro, Ill., has been promoted to assistant engineer at Jackson.

F. W. Small, supervisor of bridges and buildings of the Illinois division of the Chicago & Eastern Illinois, with headquarters at Salem, Ill., has been promoted to division engineer of that division, with the same headquarters, effective December 1, to succeed **A. W. White,** whose death on November 15 is noted elsewhere in these columns.

W. O. Rutherford, roadmaster on the Iowa division of the Chicago Great Western, with headquarters at St. Joseph, Mo., has been promoted to division engineer of the same division, with headquarters at Des Moines, Iowa, succeeding **F. J. Hoffman,** who has been transferred to the Minnesota division, with headquarters at St. Paul, Minn., to replace **T. W. Fatherson,** who has been assigned to other duties.

A. C. Hoyt, assistant division engineer on the Iowa division of the Chicago Great Western, with headquarters at Des Moines, Iowa, has been appointed engineer of surveys, with headquarters at Chicago, to succeed **H. W. Smith,** resigned. **J. T. Gibbons,** a rodman, has been promoted to assistant division engineer of the Iowa division, with headquarters at Des Moines, Iowa, to succeed Mr. Hoyt.

J. R. Nagel, division engineer of the Eastern division and the Kansas City terminals of the Missouri Pacific, with headquarters at Kansas City, Mo., has been promoted to district engineer of the Western district, with the same headquarters, to succeed **E. Sullivan,** whose appointment as superintendent is noted elsewhere in these columns. **P. P. Wagner** has been appointed division engineer of the St. Louis terminal and Illinois divisions and of the Missouri-Illinois Railroad east of the Mississippi river, with headquar-

ters at St. Louis, Mo., to succeed **H. D. Knecht,** who has been transferred to the Eastern division and the Kansas City terminals, with headquarters at Kansas City, to succeed Mr. Nagel. These appointments become effective January 1.

Adrian M. Saylor, an instrumentman on the Cumberland Valley division of the Louisville & Nashville, has been promoted to assistant engineer, with headquarters at Middlesboro, Ky., to succeed **Howard C. Forman,** whose promotion to assistant division engineer of the Cumberland Valley division, was reported in the October issue. **T. D. Williams,** an instrumentman on the Cincinnati division, has been promoted to assistant engineer at Latonia, Ky., to succeed **R. C. Young,** who has been transferred to the Birmingham division. **Walter E. Quinn,** an instrumentman on the Eastern Kentucky division, has been promoted to assistant engineer, with headquarters at Ravenna, Ky.

Elmer L. Anderson, who has been appointed division engineer of the Eastern division of the St. Louis-San Francisco, with headquarters at Springfield, Mo., as reported in the December issue of *Railway Engineering and Maintenance*, has been connected with the engineering and maintenance of way departments of the Frisco for 25 years. He was born on October 20, 1888, at Hull, Ill., and obtained his engineering education at the University of Missouri, graduating with a bachelor of science degree in civil engineering in 1912. He entered the service of the Frisco on December 28 of the same year, serving as a rodman and transitman until May 1, 1916, when he was advanced to assistant engineer. From September 4, 1917, to July 1, 1919, he served in the United States Army, returning at the end of this period to the Frisco as an assistant engineer. On September 1, 1928, he was promoted to division engineer, returning to the position of assistant engineer on September 1, 1929. From December 1, 1931, until his recent promotion to division engineer on November 1, 1937, he served as a roadmaster.

George M. Taylor, who has been appointed district engineer on the Southern Pacific at Dunsmuir, Cal., as reported in the December issue, was born on January 28, 1884, at San Francisco, Cal., and was educated at the University of California, graduating with the class of 1906. In May of the same year he entered railway service with the Southern Pacific, serving as a chainman and rodman on a location party until May, 1907, when he became a draftsman on the Northwestern Pacific (a subsidiary of the Southern Pacific). From May, 1908, to September, 1910, Mr. Taylor served as an instrumentman and draftsman on a location party for the Southern Pacific. From January, 1911, to April, 1912, he was chief of party on the relocation of industrial tracks for a commercial concern, then returning to the Southern Pacific as an instrumentman on the Shasta division. In April, 1915, he was promoted to assistant engineer on the same division and on July 1, 1918, he was further advanced to assistant division engineer on that division. On October 1, 1932, Mr. Taylor was appointed assistant district engineer of the Shasta district of the Sacramento division, which position he was holding at the time of his recent promotion to district engineer, effective November 22.

L. H. Hornsby, assistant engineer of bridges of the Seaboard Air Line, has been promoted to engineer of bridges, with headquarters as before at Norfolk, Va., to succeed **E. A. Frink,** who is retiring from active duty after having served this company for over 31 years.

Mr. Frink was born on February 25, 1862, at Germantown, Pa., and obtained his first experience in the bridge engineering field in the service of the Berlin Iron & Bridge Company, East Berlin, Conn.,

E. A. Frink

with which company he was connected from 1887 to 1898. From the latter year until 1903 he was with the Structural Iron & Steel Company, Baltimore, Md., as an officer and engineer. He entered the contracting business in 1904 and for a short time he was connected with the bridge department of the Baltimore & Ohio. In 1905, Mr. Frink became superintendent of erection of the Virginia Bridge Company, Roanoke, Va., which became a subsidiary of the Tennessee Coal, Iron & Railroad Company in 1936, leaving this company in February, 1906, to become engineer of bridges of the Seaboard Air Line. Mr. Frink has been active in the affairs of various technical societies, including the American Railway Engineering Association, which he served as a director for three years and as chairman of the committee on Wooden Bridges and Trestles for five years. He has for many years been a member of the Consulting Bridge committee of the Railroad Presidents' Conference Committee on Valuation.

William J. Kernan, whose promotion to assistant division engineer of the Pennsylvania division of the New York Central, with headquarters at Jersey Shore, Pa., was reported in the December issue, was born on November 24, 1896, and received his higher education at Rensselaer Polytechnic Institute, from which he was graduated with the degree of civil engineer. He began his railway career on the New York Central on August 1, 1917, as a chainman on the Mohawk division at Albany, N. Y., and from then until April, 1929, he held at various times the positions of chainman, rodman, draftsman, transitman and bridge inspector, practically all of the time located at Albany. On April 1, 1929, he was promoted to assistant engineer on the Rochester division, at Rochester, N. Y., and on October 20, 1931, he became assistant supervisor of track on the Syracuse division, at Canandaigua, N. Y., where he remained until April 1, 1935, when he was transferred to the Mohawk division, at Fonda, N. Y., where he was located at the time of his recent promotion to the position of assistant division engineer.

Track

A. L. King, a section foreman on the Mobile & Ohio at Wickliffe, Ky., has been promoted to track supervisor, with headquarters at Murphysboro, Ill.

R. E. Knapp, roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Albuquerque, N.M., has been transferred to La Junta, Colo., to succeed **R. R. Ellison,** who has been assigned to other duties.

H. J. Willard, assistant engineer on the Denver & Rio Grande Western, with headquarters at Alamosa, Colo., has been promoted to roadmaster, with headquarters at Helper, Utah, to succeed **O. M. Flatberg,** who has been transferred to Walsenburg, Colo., to replace **H. C. Webb,** who has retired. **R. A. Fox,** a track inspector with headquarters at Pueblo, Colo., has been promoted to roadmaster at Grand Junction, Colo., to succeed **J. A. Rask,** who has been transferred.

Ross B. Johnson, assistant roadmaster on the Chicago & North Western, with headquarters at Adams, Wis., has been promoted to roadmaster on Sub-division No. 1 of the Wyoming division, with headquarters at Chadron, Neb., succeeding **Richard Coleman,** who has been transferred to Sub-division No. 4 of the Madison division, with headquarters at Adams, replacing **J. M. McDermitt,** roadmaster at Butler, Wis., who is retiring after 50 years service with the North Western.

George M. Cookson, roadmaster on the Northern Pacific at Tacoma, Wash., has been transferred to the Fargo division, with headquarters at Fargo, N. D., to succeed **Theodore A. Gregory,** who has been transferred to Jamestown, N. D., where he replaces **William S. McCarthy.**

Frank C. Welch has been appointed acting roadmaster at Minneapolis, Minn., to succeed **George W. Minkel,** who has been transferred with the same headquarters, to replace **Paul R. Gibson.** Mr. Gibson has been appointed acting division roadmaster, with headquarters at Minneapolis, to succeed **Howard W. McCauley,** whose appointment as trainmaster of the Minnesota & International is noted elsewhere in these columns.

Nicholas V. Fehn, an instrumentman on the Evansville division of the Louisville & Nashville, has been promoted to track supervisor, with headquarters at Russellville, Ky., to succeed **C. N. Petty,** who has been transferred to Irvington, Ky. Mr. Petty relieves **J. B. Reeder,** who has been transferred to Springfield, Tenn.,

where he replaces **James B. Cochran,** whose appointment as assistant division engineer, with headquarters at Louisville, Ky., was reported in the November issue.

Effective December 6, 1937, the following roadmasters on the St. Louis-San Francisco had their headquarters transferred to Fort Scott, Kan.: **H. W. Cooper,** Eleventh track division, formerly located at Lamar, Mo.; **B. H. Crosland,** Twelfth track division, formerly of Farlington, Kan.; and **W. Marsh,** Tenth track division, formerly of Paola, Kan. In addition, **G. C. Harris,** roadmaster of the Thirty-First track division, had his headquarters transferred from Baxter Springs, Kan., to Joplin, Mo.

John L. Marsh, who has been appointed roadmaster on the Southern Pacific, with headquarters at Niland, Cal., as reported in the December issue, was born on July 27, 1894, at Pangburn, Ark. Mr. Marsh first entered railway service in 1914 with the Missouri & Arkansas, serving with this company until 1921, as a section foreman. On July 26, 1925, he entered the service of the Southern Pacific as a section foreman and was serving in this capacity on the Los Angeles division at the time of his recent promotion to roadmaster, which was effective on October 1, 1937.

Clifford O. Henry, who has been appointed roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Red Wing, Minn., as reported in the November issue, was born on March 7, 1901, at Lakeville, Minn. After a public school education he entered railway service with the Milwaukee on April 1, 1915, as a section laborer on the Iowa & Southern Minnesota division at Elko, Minn. On June 18, 1923, Mr. Henry was promoted to section foreman on the same division at Lonsdale, Minn., holding this position until July 20, 1926, when he was transferred to the main line as section foreman at Dundas, Minn. Mr. Henry continued to serve as section foreman at Dundas until his recent promotion to roadmaster at Red Wing, except for certain of the summer months. During the summers of 1934 to 1937, inclusive, he was in charge of extra gangs with the title of general foreman.

George Auer, Jr., whose promotion to supervisor of track on the New York Central, with headquarters at Corning, N. Y., was announced in the December issue, was born on October 10, 1896, at Tuckahoe, N. Y., and received his higher education at Columbia University, from which he was graduated with the degree of civil engineer. He started his railway career on the New York Central, as a chainman on March 6, 1918, in the office of the district engineer at New York, and in May of the same year, was promoted to rodman with the same headquarters, holding this position until November 1, 1923, when he was promoted to instrumentman at New York. On April 16, 1924, Mr. Auer was promoted to clearance engineer, in the office of the engineer maintenance of way, at New York, and on December 1, 1925, he was appointed assistant supervisor of track on the Syracuse division, at Rochester, N. Y., where he was located until his recent promotion to supervisor of track with headquarters at Corning.

H. C. Fryer, extra gang foreman on the Electric division of the New York Central, has been promoted to assistant supervisor of track on the Eastern division, with headquarters at Brewster, N. Y., succeeding **Carlisle Breth,** who has been transferred to the Electric division, with headquarters at Harmon, N. Y. **Francis H. Egan,** assistant supervisor of track on the Electric division, with headquarters at Spuyten Duyvil, N. Y., has been promoted to supervisor of track on the Pennsylvania division, with headquarters at Jersey Shore, Pa., where he takes the place of **Robert C. Campman** who has been transferred to the Mohawk division, with headquarters at Albany, N. Y. Mr. Campman succeeds **George W. Clark,** who has been transferred to the Buffalo division, with headquarters at North Tonawanda, N. Y., to take the place of **George W. Eberhardt,** who has retired after nearly 48 years service with the New York Central.

Mr. Egan, promoted to supervisor of track at Jersey Shore, was born on September 21, 1897, at Pocantico Hills, N. Y. He started his railway career with the New York Central as a laborer on May 1, 1915, and on April 16, 1916, he became a timekeeper on the Hudson division, with headquarters at Beacon, N. Y. He became a rodman in the maintenance department on the Eastern division of the road at New York on October 17, 1917, and on May 1, 1918, became a draftsman in the same department, at the same point. On October 11, 1918, Mr. Egan was promoted to assistant supervisor of track on the Eastern division at Hudson, N. Y., and was subsequently transferred to the Electric division, at Spuyten Duyvil, where he was located at the time of his recent promotion to supervisor of track at Jersey Shore.

Fred B. Wilcox, whose promotion to supervisor of track on the Pennsylvania division of the New York Central, with headquarters at Clearfield, Pa., was reported in the December issue, was born on September 2, 1892, at Parishville, N. Y., and received his higher education at Clarkson College of Technology, from which he was graduated with the degree of civil engineer. He started his railway career with the New York Central on January 8, 1917, as a chainman in the maintenance of way department at Oswego, N. Y., and on April 16, of the same year, was promoted to rodman at the same point. On April 16, 1919, he was promoted to transitman, and on July 26, 1920, was made instrumentman at Toledo, Ohio. On October 15, 1920, he was transferred to the Syracuse division, at Syracuse, N. Y., as a transitman, and on March 1, 1922, he was promoted to assistant supervisor of track on the Buffalo division, at Batavia, N. Y. On July 1, 1935, he became assistant division engineer of the Pennsylvania division, at Jersey Shore, Pa., where he was located at the time of his recent promotion to supervisor of track.

Bridge and Building

A. A. Tuttle has been appointed acting supervisor of bridges and buildings of the Colorado division of the Union Pacific, with headquarters at Denver, Colo., to succeed **Charles H. Land,** who is on a leave of absence. Mr. Tuttle's appointment became effective on December 9.

C. M. Schnaidt, supervisor of scales of the Chicago & Eastern Illinois, has been appointed supervisor of bridges and buildings of the Illinois division with headquarters at Salem, Ill., to succeed **F. W. Small,** whose appointment as division engineer of the same division is noted elsewhere in these columns. **R. C. Baker,** assistant on the engineering corps, has been appointed supervisor of scales, with headquarters at Danville, Ill., to succeed Mr. Schnaidt.

Joseph Hazelwood, assistant supervisor of bridges and buildings of the Lake Erie & Western district of the New York, Chicago & St. Louis, with headquarters at Frankfort, Ind., has been promoted to supervisor of bridges and buildings of the same district and with the same headquarters, to succeed **P. P. Lawrence,** who retired on January 1 after 50 years service with this company. **R. F. Miller,** fence agent, has been promoted to assistant supervisor of bridges and buildings at Frankfort to succeed Mr. Hazelwood.

Obituary

Henry E. Yeomans, division engineer of the Great Northern at Grand Forks, N. D., died at that point on October 30, at the age of 52.

Fred H. Frailey, division engineer of the Oklahoma division of the Atchison, Topeka & Santa Fe, with headquarters at Arkansas City, Kan., died on December 13 at Oklahoma City at the age of 58 years.

Alvin T. White, division engineer of the Illinois division of the Chicago & Eastern Illinois, with headquarters at Salem, Ill., whose death on November 15 was reported in the December issue, was 63 years of age and had been connected with the engineering department of the C. & E. I. for over 35 years. A native of Indiana, Mr. White entered the service of the C. & E. I. as a draftsman in the engineering department at the beginning of the century. Advancing through various positions he was promoted to division engineer at Salem on September 1, 1916, holding this position continuously until his death.

Morris S. Blaiklock, formerly assistant chief engineer of the Canadian National, whose retirement from active service in July, 1931 was announced in the August issue of that year, died on November 25, at the age of 78, at Montreal, Que., Canada. Mr. Blaiklock entered the service of the Canadian National in 1880, when he joined the engineering staff as a draftsman. In the fall of 1890 he was appointed resident engineer on the construction of the St. Clair tunnel at Sarnia, Ont., continuing there until 1893, when he became

inspector of operation at Montreal. In 1897 has was appointed resident engineer of the Eastern district of the road at Montreal, and in 1902 he became a superintendent. Mr. Blaiklock was appointed engineer maintenance of way in 1907, and in

Morris S. Blaiklock

1923 was appointed assistant chief engineer, the position he held at the time of his retirement. In connection with his duties on the engineering staff of his road, Mr. Blaiklock was active in the establishment and operation of the road's co-operative management plan with its maintenance of way employees.

George H. Pegram, chief engineer of the Interborough Rapid Transit Company, New York, and from 1893 to 1898 chief engineer of the Union Pacific System, died in the Brooklyn Hospital, at Brooklyn, N. Y., on December 23, at the age of 81. Mr. Pegram was born at Council Bluffs, Iowa, December 29, 1855, and received his higher education at Washington University, St. Louis, Mo., from which he was graduated in 1877 with the degree of Civil Engineer. For two years, 1877 and 1878, Mr. Pegram was employed as engineer of construction of the Utah & Northern railway in Idaho, and then became principal assistant engineer to the bridge engineer of the road, which position he held until 1880. He then became chief engineer of the Edge Moor Iron Company, Wilmington, Del., which position he held until 1888, when he became a consulting engineer, with headquarters at New York City. In 1889, he became consulting engineer of the Missouri Pacific, and in 1893 left this road to become chief engineer of the Union Pacific. Mr. Pegram continued in this capacity until 1898, when he went to New York as chief engineer of the Manhattan Elevated Railroad. When this road was merged with the Interborough Rapid Transit Company in 1905, he became chief engineer of this company, and also of the Rapid Transit Subway Construction Company, which position he held until the time of his death.

William J. Harahan, president of the Chesapeake & Ohio, the Pere Marquette and the Nickel Plate, and formerly chief engineer of the Illinois Central, died on December 14 at the C. & O. company hospital at Clifton Forge, Va., as the result of an intestinal ailment. A native of Nashville, Tenn., Mr. Harahan was born in 1867 and received his college education at St. Johns College, New Orleans, La. He first entered railroad service in 1881 at the age of 14 as a part-time messenger and clerk in the superintendent's office of the Louisville & Nashville at New Orleans, La., transferring to the shops as an apprentice in 1884. Two years later he entered the service of the engineering department and in 1889 he went with the Chesapeake & Ohio as engineer maintenance of way of the Cincinnati division. In 1890 Mr. Harahan joined the Baltimore & Ohio Southwestern as engineer in charge of structures and after three years in this capacity he entered the service of the Illinois Central, where he served as

William J. Harahan

roadmaster and trainmaster on the Pontiac division. Subsequently he served as assistant superintendent and superintendent, holding the latter position until 1901, when he was made chief engineer. In 1902 Mr. Harahan became assistant general manager of the Illinois Central and in 1905 he was advanced to fourth vice-president and general manager. From January to July, 1907, he served as vice-president in charge of traffic and engineering, leaving the Illinois Central at the end of this period to become assistant to the president of the Erie, where he was elected vice-president in charge of engineering in January, 1911. In September of the following year Mr. Harahan was elected president of the Seaboard Air Line, and from July, 1918, to March 1, 1920, during the war administration, he served as general manager of the S. A. L. From April to December, 1920, he served as a member of the Railroad Board of Adjustment, No. 1, Division of Labor, United States Railroad Administration. From 1920 to 1929 he occupied the presidency of the Chesapeake & Ohio, becoming in the latter year senior vice-president, which position he held until July, 1935, when he again became president of the C. & O. and, in addition, of the Pere Marquette and the Nickel Plate.

Edward P. Bracken, formerly a roadmaster on the Chicago, Burlington & Quincy, who retired on January 1, 1933, as executive vice-president of this company, the Colorado & Southern and allied lines, with headquarters at Chicago, died on December 31 at his winter home at Winter Park, Fla., at the age of 78 years. Mr. Bracken first entered the service of the Burlington in August, 1887, as a gang foreman on the Illinois division and subsequently served as an extra gang foreman, a track foreman and as a roadmaster, serving in the latter capacity for about 13 years. He was then advanced to trainmaster and in November, 1905, he was further promoted to assistant superintendent of the Lincoln division. In the following year Mr. Bracken was advanced to division superintendent and served successively in this capacity on the Lincoln, Sterling, Sheridan, Brookfield and Galesburg divisions. On May 15, 1909, he was promoted to general superintendent of the Wyoming division and on February 1, 1910, he was further promoted to assistant general manager of the Lines East of the Missouri river, with headquarters at Chicago. Two years later he became general manager of the Lines East, and in 1917 he was elected vice-president in charge of operation. On August 9, 1918, during federal control of the railroads, Mr. Bracken was appointed general manager of the Burlington, and on November 6, 1919, he was appointed federal manager. On the

Edward P. Bracken

termination of federal control in 1920, he resumed the position of vice-president in charge of operation, which position he continued to hold until his election as executive vice-president in 1931.

Association News

Bridge and Building Association

The Executive committee met in Chicago on Saturday, December 11, with Vice-Presidents F. H. Masters, W. S. Lacher, C. A. J. Richards, Secretary-Treasurer C. A. Lichty, Director R. E. Dove and Past-Presidents C. R. Knowles and Elmer T. Howson, present. At this meeting committee personnel was selected and acceptances are now being secured from those chosen.

Plans were made for the annual get-together luncheon of members and meeting of the Executive committee during the

American Railway Engineering Association convention in March, details of which will be announced later. The Hotel Stevens was selected as headquarters for the next annual convention which will be held on October 18-20.

Roadmasters Association

President W. O. Frame is now completing the organization of committees for the ensuing year and expects to announce the personnel shortly. The Executive committee will meet in Chicago on Tuesday, March 15, during the annual convention of the American Railway Engineering Association.

Maintenance of Way Club of Chicago

Fifty members and guests attended the meeting on December 13, when Walter S. Lacher, managing editor of *Railway Engineering and Maintenance*, presented a paper on Erosion Problems of the Railroads. The next meeting will be held on Monday evening, January 24, when W. E. Fuller, assistant to vice-president, Chicago, Burlington & Quincy, will address the club on the Relation of the Maintenance of Way Department to the Operating Department.

Metropolitan Track Supervisors' Club

More than 60 members and guests attended the meeting on the afternoon of December 9, at the Hotel McAlpin, New York City. Following luncheon, the meeting was addressed by W. C. Heidenthal, chief engineer of the New York, Ontario & Western, who discussed the stringent present-day responsibilities of track supervisory officers, and possible opportunities for higher standards and increased efficiency in track maintenance.

American Railway Engineering Association

With the mailing at the end of the year of Bulletin No. 400, containing the reports of six committees, the members of the association will have in their hands three bulletins, embracing a total of 15 reports to be presented at the convention in March. The remaining 16 reports will be issued in two other bulletins to be mailed in January and February, respectively.

As the work on the reports is practically completed, no committee meetings have been scheduled for January and only three committees found it necessary to hold meetings in December.

As a result of action of the Nominating Committee, which met at New York on December 9, the following names will appear on the ballot that is to be mailed shortly to the members:

President, F. E. Morrow, chief engineer, Chicago & Western Indiana, and Belt railways of Chicago, Chicago.

Second Vice-President, G. S. Fanning, chief engineer, Erie, Cleveland, Ohio.

Directors (three to be elected) H. Austill, chief engineer, Mobile & Ohio, St. Louis, Mo.; F. R. Layng, chief engineer, Bessemer & Lake Erie, Greenville, Pa.; R. C. White, assistant general manager Missouri Pacific, St. Louis, Mo.; W. M. Vandersluis, general superintendent telegraph and signals, Illinois Central, Chicago; J. G. Brennan, engineer of grade crossings, Association of American Railroads, Washington, D.C.; J. B. Akers, assistant chief engineer, Southern, Washington, D.C.; C. J. Geyer, engineer maintenance of way, Chesapeake & Ohio, Richmond, Va.; M. J. J. Harrison, supervisor of scales, Pennsylvania, Altoona, Pa.; and O. F. Dalstrom, engineer of bridges, Chicago & North Western, Chicago.

Members of the Nominating committee (five to be elected), W. M. Wilson, research professor, structural engineering, University of Illinois, Urbana, Ill.; G. P. Palmer, engineer maintenance and construction, Baltimore & Ohio Chicago Terminal, Chicago; G. A. Haggander, bridge engineer, Chicago, Burlington & Quincy, Chicago; L. G. Morphy, general manager and chief engineer, Rutland, Rutland, Vt.; G. F. Hand, general assistant engineer, New York, New Haven & Hartford, New Haven, Conn.; J. E. Teal, transportation engineer, Chesapeake & Ohio, Richmond, Va.; J. A. Lahmer, senior assistant engineer, Missouri Pacific, St. Louis, Mo., D. B. Thompson, mechanical and electrical engineer, New York Central, New York; R. A. Van Ness, bridge engineer system, Atchison, Topeka & Santa Fe, Chicago; and A. D. Kennedy, assistant engineer, Atchison, Topeka & Santa Fe, Chicago.

Supplementing the above list, E. M. Hastings, chief engineer, Richmond, Fredericksburg & Potomac, will be advanced automatically from second vice-president to first vice-president, under the provision of the constitution. As the secretary and treasurer, according to the recently adopted change in the constitution, are now appointed by the Board of Directors, these positions no longer appear on the ballot.

Wood Preservers Association

The American Wood Preservers Association will hold its thirty-fourth annual convention at the Congress Hotel on January 18-20. The program includes reports from various standing and special committees on recent developments in the technique of timber preservation, including the pressure treatment of ties, of timber and lumber, of yellow pine piles, of Douglas fir, of poles and of posts, the report of a special committee on the revision of treatment standards to harmonize them, and reports of committees on service records of crossties, bridge and structural timber, marine piling, poles and posts.

The session on Wednesday forenoon has been termed Users' Day. At this session, C. J. Geyer, engineer maintenance of way, Chesapeake & Ohio, will present a paper on The Pre-Framing of Timber Before Treatment for Use in Bridges and Buildings; and Robert H. Ford, chief engineer, Chicago, Rock Island & Pacific System, will speak on The Rock Island's Observations in the Use of Treated Crossties. On Tuesday evening, Dr. Hermann von Schrenk, consulting timber engineer, St. Louis, Mo., will speak on Termites in Buildings. His address will be supplemented by the University of California film showing termites at work.

Supply Trade News

General

The assets, manufacturing plant and equipment of **Wappat, Inc.**, manufacturers of portable saws, grinders and drills, Pittsburgh, Pa. have been purchased by the **Mall Tool Company,** Chicago.

Having completed 50 years of service to the railroad and construction industries, the **Robert W. Hunt Company,** Chicago, is this year celebrating its golden anniversary. Founded in 1888 by Captain Robert W. Hunt and associates, the original purpose of the company was the inspection of rails but its service was later expanded to include other railway materials and equipment and construction materials as a whole. From a necessarily small beginning the company has grown to such an extent that it now carries on a world-wide business.

Personal

J. J. Nolan has been appointed southwestern representative of the railway appliances division of the **American Fork & Hoe Company,** with headquarters at St. Louis, Mo., to succeed C. E. Irwin, deceased.

G. M. Hogan has been appointed manufacturer's agent with offices at 320 South Michigan avenue, Chicago, to represent the **Sellers Manufacturing Company,** Chicago, the **Rails Company,** New Haven, Conn., and the **Centaur Tractor Corporation,** Greenwich, Ohio.

Arthur A. Murphy has been appointed manager of railway sales of the **Chipman Chemical Company, Inc.,** with headquarters at Bound Brook, N. J. Mr. Murphy was born on August 18, 1893, at Buffalo, N. Y., and began his busines career in 1913 as a member of the sales staff of the Adams & Elting Company, paint manufacturers at Chicago. In 1918, he left this company to become connected with E. I. duPont de Nemours & Co., Inc.,

Arthur A. Murphy

as director of foreign sales of paints, varnishes and raw materials, with headquarters at New York. In 1922 Mr. Murphy was placed in charge of railroad sales for the paint and varnish division in the east, holding this position until 1926, when he resigned to become vice-president in charge of sales of the Industrial Rayon Corporation, Cleveland, Ohio. From 1933 to 1936 he served as sales manager of the "Beetle" ware division of the American Cyanamid Corporation, New York.

At a meeting of the board of directors of the **United States Steel Corporation of Delaware,** held in New York on December 9, **Benjamin F. Fairless** was elected president, and the following vice-presidents, with their respective duties, were elected: **Thomas Moses,** raw materials; **Walther Mathesius,** operations; **C. V. McKaig,** sales; **William Beye,** counsel and industrial relations; **Max D. Howell,** secretary and treasurer; **R. E. Zimmerman,** research; **C. H. Rhodes,** purchases; **Harold L. Hughes,** special duties, New York. After the election of officers, the executive committee, composed of the following members, was appointed: **Benjamin F. Fairless,** chairman; **William Beye, B. F. Harris, C. F. Hood, Max D. Howell, Walther Mathesius, C. V. McKaig, Thomas Moses, J. L. Perry, E. R. Stettinius, Jr., E. M. Voorhees,** and **R. E. Zimmerman.** G. Cook Kimball and Walther Mathesius were elected directors of the United States Steel Corporation of Delaware on December 8.

T. M. Robie, who has been in charge of Diesel sales to resale manufacturers for **Fairbanks, Morse & Company,** has been appointed manager of the Diesel sales

T. M. Robie

division at Chicago. Mr. Robie graduated from the University of Michigan in 1914, where he specialized in the study of internal combustion engines and later was employed by the General Electric Company on locomtive tests and on the development of high-speed opposed-piston Diesel generating sets for stationary and Diesel-electric railway locomotive application. For two years he operated Diesel power plants in New Mexico. Upon returning from the World War he became associated with Fairbanks, Morse & Company, during which time he was associated with the New York branch office one year, and the Dallas office for two years and was employed at the factory on Diesel engine designing, testing and building for nine years. Since 1932 he has been in charge of Diesel sales to re-sale manufacturers.

John F. MacEnulty, vice-president in charge of sales of the **Pressed Steel Car Company, Inc.,** Pittsburgh, Pa., was elected president and a member of the board of directors, and **George H. Fleming,** who had served as director and vice-president in charge of the Pittsburgh office, was elected executive vice-president, at a meeting of the board on December 3. Mr. MacEnulty began work with the Pressed Steel Car Company in February, 1899. He was appointed engineer of construction in 1903, and the following year was transferred to the New York sales department. In 1907 he was appointed general superintendent of the Western Steel Car

John F. MacEnulty

& Foundry Co., a subsidiary of the Pressed Steel Car Company, and two years later, was appointed general manager of the same company. In June, 1912, Mr. MacEnulty was appointed sales manager of the Pressed Steel Car Company and subsidiaries, and from January, 1916, served as vice-president and a director until its recent reorganization, when he became vice-president in charge of sales of the reorganized company, the Pressed Steel Car Company, Inc.

C. F. Hood, executive vice-president of the **American Steel & Wire Company,** the **Cyclone Fence Company** and the **Standard Fence Company,** all subsidiaries of the **United States Steel Corporation,** has been elected president of the three companies, with headquarters as before at Cleveland, Ohio, to succeed **C. F. Blackmer,** who has resigned and who also relinquishes directorships in these companies and smaller affiliates of the corporation. **M. W. Reed,** vice-president of the American Steel & Wire Company, has been elected a director of that company. These changes became effective on January 1.

Mr. Hood was born in Monmouth, Ill., on February 8, 1894, and graduated from the University of Illinois in 1915. His entire work since leaving college has been in the wire industry. He started first with the Packard Electric Company, Warren, Ohio, as sales engineer and assistant cable sales manager. In 1917 he entered the employ of the American Steel & Wire Company at Worcester, Mass. as an operating clerk. With the exception of an interval from 1917 to 1919, when he was in the United States army, he has been with the wire company, holding such positions as foreman, assistant superintendent, super-

C. F. Hood

intendent, district manager and vice-president in charge of operations.

Mr. Blackmer was born on April 1, 1879, at Worcester, Mass., and graduated from Colorado College in 1897. After a short term of employment with the Colorado Trading & Transfer Company at Cripple Creek, Col., he became associated with the Washburn Moen Manufacturing Company, Waukegan, Ill., in 1898. Later this company was taken over by the American Steel & Wire Company. At Waukegan, Mr. Blackmer was employed in vari-

C. F. Blackmer

ous departments and rose to the position of assistant general superintendent. In 1920, he was transferred to Duluth as superintendent of the wire mills of the Minnesota Steel Company, also a subsidiary of the United States Steel Coropration. In 1925 he became district manager of the American Steel & Wire Company at Pittsburgh, which position he held until January, 1929, when he was transferred to Cleveland, Ohio, as general superintendent. In 1931, he was made vice-president in charge of operations, being elected president in 1933.

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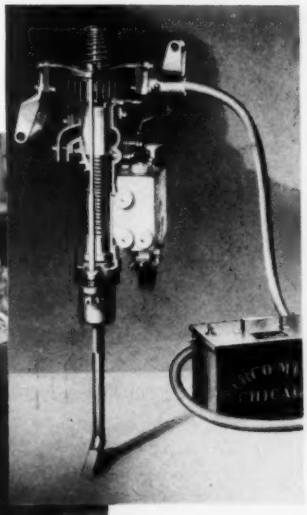

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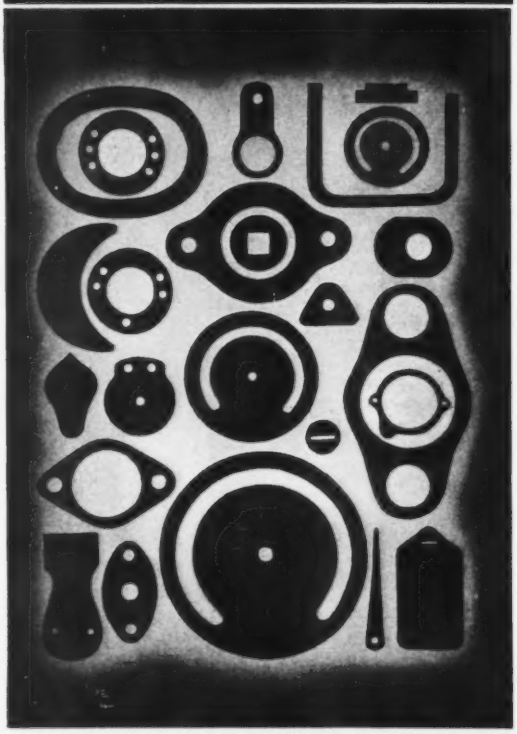

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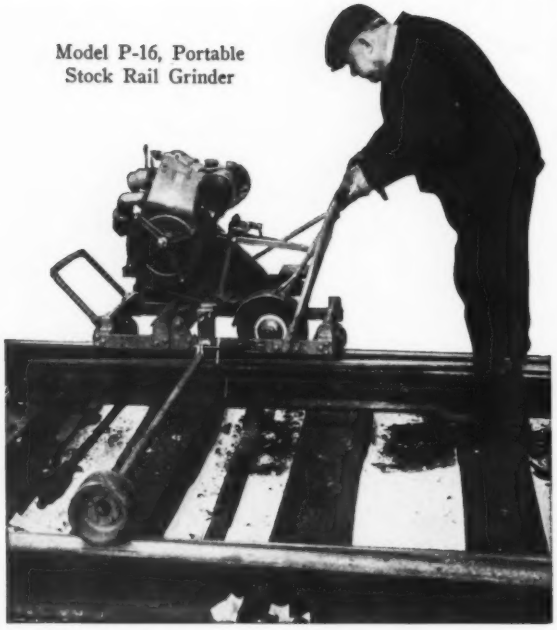

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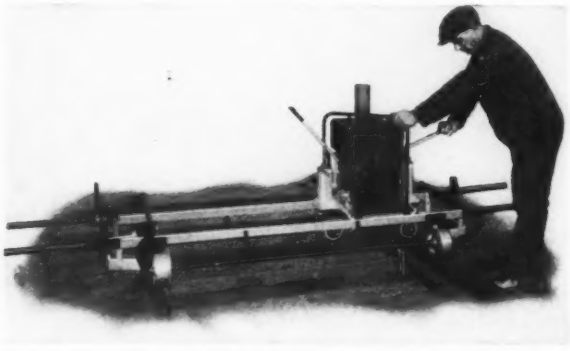

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Railway Track-work Co.

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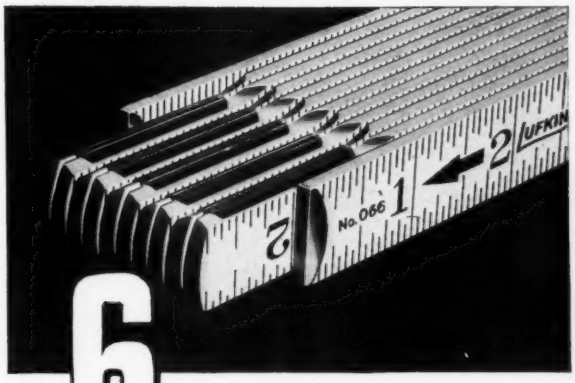

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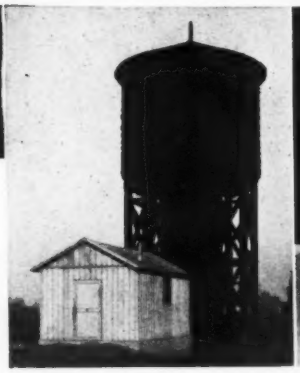

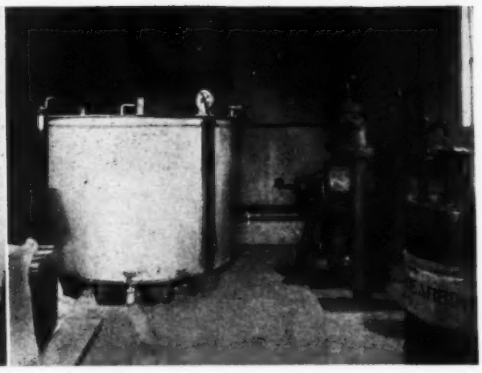

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"The results from Dearborn Treatment are so pronounced that the Master Mechanic in charge at _____ requested me to prepare a treatment schedule for roundhouse stationary boilers at this point."

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DEARBORN CHEMICAL COMPANY

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205 E. 42nd Street NEW YORK

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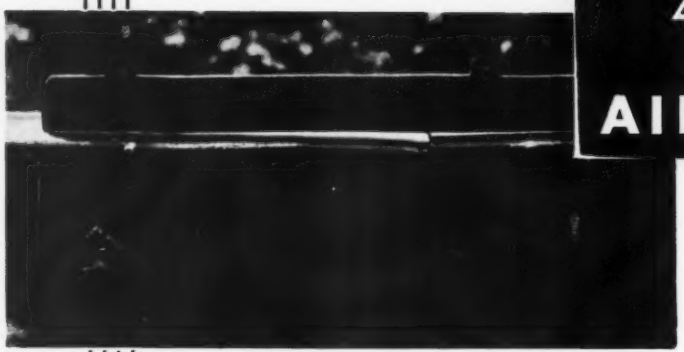
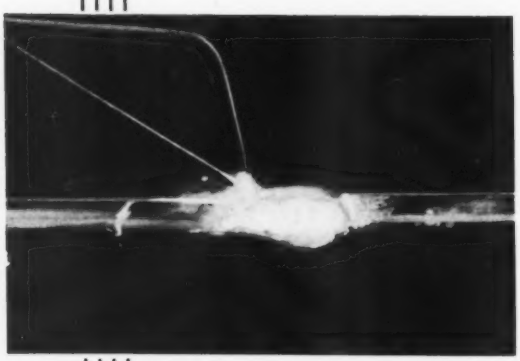
BUILD UP your RAIL ENDS

in half the time with 40% less gases by

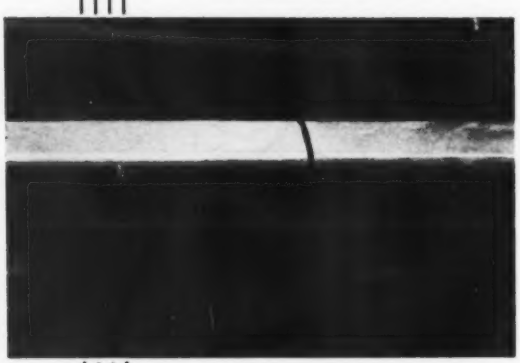
AIRCOWELDING



Straight edge shows amount of building-up required on these battered rail ends.



AIRCOWELDING with AIRCO-DB R.R. ROD, specially developed for rail ends, frogs and switch points.



Completed rail ends, good as new. Now heat treat them and they will not have to be built up again.

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And this easier and faster Aircowelding process enables you to make additional savings in rods and gases of from 40 to 50 percent. It is the low cost way to take batter out of rail ends . . . and keep it out.

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